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1964-1965

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DEPARTMENT OF AGRICULTURE

NEW SOUTH WALES

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COMMONWEALTH MYCOLOGICAL INSTITUTE
15 JUL 1966

1965

(Second Session)

PARLIAMENT OF NEW SOUTH WALES

REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

Year ended 30th June, 1965

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ADMINISTRATIVE AND SENIOR SUPERVISORY PERSONNEL*

As at 30th June, 1965

Minister for Agriculture	Hon. W. A. Chaffey, M.L.A.
Director-General	Dr G. Edgar.
Deputy Director-General	Mr R. M. Watts.
Secretary	Mr J. L. Hager.
Accountant	K. A. Russell.
Administrative Assistant and Personnel Officer	S. W. Wise.
Pastures Protection Officer	J. B. B. Owen.
Legal Officer	S. T. Beal.
Architect	H. A. Browne.
Chief Biometrician	F. C. McCleary.
Chief Research Liaison Officer	Dr S. L. Macindoe.
Division of Plant Industry—	
Chief	W. H. G. Poggendorff.
Deputy Chief	A. C. Orman.
Principal Agronomist (Reseatch)	L. R. Kavanagh.
Principal Agronomist (Extension)	G. Nicholson.
Principal Agronomist (Pastures)	W. T. Atkinson.
Principal Agronomist (Miscellaneous Crops)	T. E. Kitamura.
Division of Horticulture—	
Chief	B. O. French.
Deputy Chief	J. A. Ballantyne.
Principal Fruit Officer (Extension)	R. G. S. Kebby.
Principal Fruit Officer (Research)	J. K. Long.
Principal Fruit Officer (Viticulture)	G. R. Gregory.
Senior Inspector (Export and Import Branch)	R. W. Robertson.
Division of Animal Industry—	
Chief	R. A. Hall.
Deputy Chief	N. K. Golding.
Director of Veterinary Research	J. C. Keast.
Principal Veterinary Research Officer	E. J. H. McBarron.
Chairman, Board of Tick Control	J. N. Henry.
Director of Cattle Tick Research	Dr R. N. McCulloch.
Principal Veterinary Officer	D. G. Christie.
Principal Veterinary Officer (Extension)	J. S. Healey.
Principal Veterinary Officer (Meat Inspection)	R. C. Cramp.
Principal Livestock Officer (Sheep and Wool)	C. J. Hawkins.
Principal Livestock Officer (Beef Cattle, Horses and Goats)	W. J. B. Murphy.
Principal Livestock Officer (Pigs)	N. A. Steel.
Principal Livestock Officer (Poultry)	Vacant.
Principal Livestock Officer (Apiculture)	A. A. Clemson.
Division of Dairying—	
Chief	D. W. Crowfoot.
Deputy Chief	C. E. Chapman.
Principal Dairy Officer	E. G. McLaren.
Principal Dairy Officer (Herd Improvement)	D. R. Scott.
Principal Dairy Officer (Hawkesbury Agricultural College)	Dr G. J. F. Smith.
Division of Science Services—	
Chief	Dr C. J. P. Magee.
Chief Biologist	W. S. Sutton.
Chief Entomologist	P. C. Hely.
Chief Chemist	T. H. Johns.
Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist	H. K. Mair.

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* For more detail of staff of the various Divisions, Branches, etc., see New South Wales Department of Agriculture brochure "Directory of Officers".

For staff number totals see tabulation in this Report, page 17.

ADMINISTRATIVE AND SENIOR SUPERVISORY PERSONNEL

As at 30th June, 1965—*continued*

Division of Information Services—

Chief	H. Parry Brown.
Editor of Publications	W. R. Turner.
Special Extension Officer (Agricultural Bureau and Group Work)	J. J. Slater.
Senior Extension Officer (Women's Service)	Miss N. M. Foskett.
Research Liaison Officer (Scientific Publications)	J. N. Potter.
Librarian-in-Charge	J. C. Hazell.

Division of Marketing and Agricultural Economics—

Chief	C. J. King.
Principal Economics Research Officer	P. C. Druce.

Hawkesbury Agricultural College—

Principal	B. Doman.
Deputy Principal	B. F. Atkins.
Farm Supervisor	T. Adams.

Wagga Agricultural College and Experiment Station—

Principal	Dr F. C. Butler.
Deputy Principal	J. R. Sutherland.
Farm Supervisor	J. C. Ballantyne.

Wagga Agricultural Research Institute—

Director	Dr A. T. Pugsley.

Regional Extension Services—

Chief	J. L. Green.
Regional Supervisors of Agriculture—	
Southern Region	R. C. Madsen.
North Coast Region	S. R. Ballard.
Western Region	B. D. Ament.
South Coast and Tablelands Region	R. W. Shelley.
South Western Region	G. A. Crawford.
Northern Region	G. R. Godden.
Mid Coast and Hunter Region	N. W. Vane.
Mid Western Region	F. J. Nicholson.
North Western Region	H. P. Hall.

Research Stations—

Chief, Research Stations Branch		A. Pearson.
Principal Officer (Management)		E. C. Powell.
Bathurst Agricultural Research Station	Manager	C. H. Mort.
Condobolin Agricultural Research Station	Manager	J. C. England.
Cowra Agricultural Research Station	Manager	J. M. Arthur.
Dareton Horticultural Research Station	Manager	J. W. Turpin.
Glenfield Veterinary Research Station	Director	J. C. Keast.
Grafton Agricultural Research Station	Manager	C. E. Collins.
Griffith Viticultural Research Station	O.I.C.	A. F. Murray.
Leeton Agricultural Research Station	Manager	C. R. Hood.
Narrabri Agricultural Research Station	Manager	F. W. Cutting.
Narara Horticultural Research Station	Manager	L. F. Mandelson.
Agricultural Research Station, Glen Innes	Manager	E. Tindale.
Poultry Research Station, Seven Hills	Manager	R. N. Macindoe.
Tamworth Agricultural Research Station	Manager	J. A. Loveridge.
Tamworth Agricultural Research Station	Director of Research	Dr W. V. Single.
Temora Agricultural Research Station	Manager	R. Thomson.
Trangie Agricultural Research Station	Manager	J. H. Ballard.
Wollongbar Agricultural Research Station	Manager	F. A. York.
Yanco Agricultural College and Research Station	Manager	F. D. Mackenzie.
Alstonville Tropical Fruit Research Station	O.I.C.	D. S. Leigh.
Dairy Industry Research (North Coast)	Supervisor	Dr F. G. Swain.

NEW SOUTH WALES

DEPARTMENT OF AGRICULTURE

Report of the Director-General to the Minister for the Year ended 30th June, 1965

Department of Agriculture,
Sydney, 28th September, 1965.

Dear Sir,

Herewith the Report of the Department of Agriculture for the year ended 30th June, 1965.

CENTRAL ADMINISTRATION NOTES

The Seasons

Pastoral conditions were reasonable during the first part of 1964-65 but from late spring generally deteriorated under sustained drought. At the end of June, 1965, only the Riverina and south western slopes were in fairly satisfactory condition.

Through July and up to mid-August, 1964, the weather was mostly cool to cold; milder at times in northern and western areas. Mild to cool conditions prevailed until late spring. Temperatures were below normal in most areas during October and November. Heatwaves occurred over the last week of November. Then warm to hot conditions, with occasional very hot periods, lasted until the end of March, 1965—except for a part of January when temperatures were lower than normal for that time of the year. April was mild to warm. May and June were cool, and there was severe cold in the last week of June, 1965.

Light to moderate rain fell in many districts early in July, 1964, but rain late in August comprised the first general falls for over two months. Rainfall was above average in September and October, except on the coast. Thereafter, to June, 1965, monthly rainfall registrations in all districts except the north coast (in June) were below and in most cases well below normal.

Rain recordings in many areas for the six months ended June, 1965, were the lowest for over 60 years. As a result, the 1964-65 drought has been accepted as the worst since 1902 in most districts.

From July, until rainfall was general late in August, 1964, the pastoral position deteriorated. Supplementary feeding of livestock had become necessary in many localities. The August rain relieved the position and with follow-up rains the pastoral situation was satisfactory until late spring, except on the north and central coast, the central plains and in the Western Division. By the end of 1964 the lower north coast and the Hunter Valley had further deteriorated. Feed shortage was common there and some stock were being moved to other districts for agistment. Elsewhere, pastures had dried off by the end of December and only dry feed was available in most inland districts. Some areas, mainly in the north and west, were then in near-drought condition.

The Drought

The drought had extended over the greater part of the State by the end of March, 1965. Only the Riverina, the south western slopes and a few central inland areas still had adequate dry feed. Pastures further deteriorated during the next three months, except for slight improvement on parts of the north coast and south coast that received good falls near the end of June, 1965.

Between early autumn and the end of June, 1965, feed shortages became more general. Hand feeding became increasingly necessary as each month passed. The central coast was the most severely affected area, especially around Dungog and Gloucester. There, pastures were practically non-existent.

Large quantities of fodder, mainly hay from Victoria and to a lesser extent from southern inland areas of New South Wales, were moved by rail and road to the hard-hit central coast districts and other northern drought affected areas as the year closed.

At the end of June, 1965, there was still some dry feed in inland southern and south western areas, and a green pick was showing on parts of the far north coast.

From two, the number of Pastures Protection Districts declared drought areas in July, 1964, for purposes of freight concessions grew to seven by December, 1964. By June, 1965, the number declared had risen to forty-four—in a total of fifty-nine Pasture Protection Districts. The non-declared districts comprised the Tweed-Lismore area, a few in the central west, also most of the Riverina and south western slopes and the part of the Western Division which adjoins the Victorian border.

Stock watering supplies generally met requirements during the last six months of 1964, except on the lower north coast and in the Hunter-Manning areas. These had reached a critical stage by the end of December, 1964.

During the first six months of 1965, water storages declined seriously. At the end of June, surface water supplies in most districts were either low or non-existent. Main exceptions were some southern inland localities and several coastal areas where rain was heavy late in June. Shortage of water caused more concern than the lack of feed in most districts. Carting of water was needed in many places to keep stock alive.

The drought has dwindled farm water supplies for stock and irrigation. Reserve and new supplies have been brought into use where possible. On the lower reaches of coastal rivers, particularly in the Hunter region, where farmers use river water for stock and irrigation, reduced flow has resulted in upstream movement of salt water. Testing of water samples by Regional officers has been a specially valuable service to land holders in these circumstances, and demand for it has greatly increased. At Maitland, 970 water samples were tested in the first six months of 1965; the peak demand was 275 samples in March.

Towards the end of June, 1965, farmers of the western districts of Victoria set up a committee to promote gifts of fodder for N.S.W. drought areas. The project has been called "Operation Goodwill". Several thousands of tons of hay are likely for despatch free to farmers in drought areas—particularly in the Mid Coast and Hunter Region. The Regional Supervisors will be responsible for distribution, through local committees. Extension officers in the Regions will assist.

Extension officers in the Regions have concentrated on assistance to farmers in drought affected areas, and part of their effort has comprised 50 "Drought Feeding Schools". Farmer attendance at these schools has already aggregated 3,000. More such schools have been planned for the immediate future.

Stock mortalities have not yet been severe, but dairy farmers and graziers have been forced to sell heavily. This has been reflected in the unusually high numbers of stock passing through abattoirs throughout the State.

The wheat crop prospects for 1965 are critically affected. Estimates are that possibly not half the total acreage reached in 1964 will be sown in 1965.

The position in central and northern inland districts could become critically serious if good rain does not come before the end of July, 1965.

Commodity, Production Notes

Although the drought had started by late 1964, another good production year was experienced.

Output of many primary products exceeded the previous year's attainments, and in several cases the production was a record. On the other hand, prospects for many of the 1965/66 crops have been seriously affected.

CEREALS

Wheat.—The 1964-65 wheat *grain* harvest of 151,483,000 bushels was the biggest ever achieved by the State; 29,011,000 bushels more than the record set by the 1963-64 season. It was the third successive production total exceeding 100,000,000 bushels. No other Australian State has so far produced more than 80 million bushels in a season. Output in 1964-65 was about 41 per cent of the Australian total of about 370,000,000 bushels.

The yield average was a record 26.3 bushels per acre; as against the previous record, 24.7 bushels per acre, set in the 1693-64 season.

Production of wheaten hay in 1964-65 was 95,790 tons; as against 89,480 tons in the previous season.

Wheat acreage sown for all purposes in 1964-65 totalled 5,928,980; 5,760,090 acres for grain, over 61,000 acres for hay, and over 107,000 acres for green fodder. Both the total acreage and the area sown for grain were records.

The extremely favourable conditions in wheat growing districts during the growing season and improvements in farm practice, soil fertility and varieties, were responsible for the high yields. Root rot diseases late in the season reduced output a little in southern and central districts.

This record wheat harvest was the sixth successive heavy crop, and it was more than double the average of the previous ten seasons. But because of the drought the 1965-66 output will be considerably less than the 1964-65 harvest.

Oats.—The oat *grain* harvest was 22,885,000 bushels, compared with 19,811,600 bushels from the previous season, and was second from highest on record. Yield average was a record 26.9 bushels per acre, exceeding the previous highest—25.1 bushels per acre in the 1886-87 season.

Oaten hay production amounted to 102,950 tons; compared with 99,660 tons in 1963-64.

The area sown for all purposes was 1,634,980 acres; 850,150 acres for grain, 65,830 acres for hay and 719,000 acres for green fodder. The area sown for grain was fourth from highest on record.

Barley.—The barley *grain* harvest was a record 6,707,000 bushels, exceeding the 1962-63 season's record production by 1,346,000 bushels. Yield average was 28.1 bushels per acre, the highest on record.

The area sown was 273,800 acres for all purposes; 238,980 acres were for grain. The total area sown and the area sown for grain were records.

Maize.—The 1964 maize *grain* harvest of 1,878,050 bushels was a little below the 2,089,200 bushels of the year before, and less than the average of the previous ten seasons.

The area sown was 52,490 acres for all purposes; 41,660 acres for grain and 10,830 acres for green fodder.

Grain Sorghum.—The 1964 grain sorghum harvest was 1,269,700 bushels from a sown area of 51,700 acres; slightly above the 1,268,700 bushels from 1963 when the sown area was 61,200 acres.

Rice.—Rice production in 1965 was about 150,555 tons, a new record; compared with the previous record of 139,800 tons set in the 1964 season.

The area harvested was a record 61,510 acres; compared with 59,390 acres sown for the previous rice crop.

Production by varieties in 1965 is of interest: 106,911 long tons Caloro; 41,185 Calrose; 2,457 Bluebonnet 50 and other long grain; 2 tons of mixed varieties.

FIBRE AND OIL CROPS

Cotton.—Figures for this new (six years old) N.S.W. irrigation crop are of special interest.

A record of 18,000 acres of cotton, all irrigated, was harvested in 1964-65; about 2.3 times the previous highest acreage in 1963-64. The yield is at least 31,000 bales; about 70 per cent of Australia's production.

Linseed.—The approximate 50,000 acres sown in N.S.W. in 1964 was a record and produced 12,000 tons linseed. Australia's production was near to 50,000 tons, whereas crushers' total needs are only 28,000 tons. Linseed on hand will meet home consumption needs for two years ahead, and export prices are unprofitable. Clearly the over-production situation seriously threatens the linseed-growing industry.

FRUIT CROPS

Pome Fruit.—Estimates for the 1964-65 apple crop have indicated a record total, exceeding 3,000,000 bushels. The pear crop, because of unfavourable fruit-setting conditions, was expected to be down considerably on the previous two or three years' figures. The drought has greatly reduced the early-estimated 3,000,000 bushels apple crop. Also it has so stressed the trees that their 1965-66 bearing capacity will have been affected. The pear trees, light-bearing during the 1964-65 drought, will not have been so stressed.

Stone Fruit.—Crops generally were heavy and very high quality, except that prune yields at Young were adversely affected by drought and tableland dessert fruit crops were reduced by spring frosts. Cherry crops were the biggest and best for several years. M.I.A. canning peach and canning apricot crops were excellent.

Citrus.—Citrus crops were heavy for the fourth successive season and the output of 6,037,000 bushels was the highest ever achieved. Production in the previous season (1963-64) was 5,327,000 bushels.

Citrus production is steadily increasing as trees planted in recent years are entering production and slightly older trees are approaching full production. Low prices have ruled. Increasing quantities of the Valencia orange crop have been directed to processors for juicing. This outlet consumed 4,000 tons in the past year.

Table Grapes.—Table grape production for 1964-65 should reach a record of 7,500 tons, compared with 7,012 tons in 1963-64. Table grape production has increased by about 500 tons per year for the last six years.

Wine Grapes and Wine Production.—Wine grape production for this year is estimated to have been a record 42,000 tons. The previous highest tonnage was 39,080 in 1964.

N.S.W. wine production in 1965 is estimated at 6,500,000 gallons; compared with 6,030,499 gallons in 1964.

Bananas.—Banana acreage has declined from 26,319 acres in 1963-64 to 24,775 in 1964-65. Production also fell, by about 0.5 million bushels, to about 4,000,000 bushels. Acreage has gradually declined from the 29,659 in 1958-59 to the 24,775 acres in 1964-65—whilst production per acre has been higher and kept total production in the vicinity of 4,000,000 bushels. Unless plantings increase, adverse seasons could lead to a shortage of bananas for market.

MEAT PRODUCTION

Preliminary figures indicate that 1964-65 beef and veal production approximated 303,000 tons; mutton and lamb 195,800 tons; pigmeats 31,500 tons; and bacon and ham 13,950 tons. Comparative 1963-64 figures were 285,960 tons beef and veal, 202,060 tons mutton and lamb, 28,720 tons pigmeats, 13,500 tons bacon and ham.

Broiler production by the poultry industry exceeded 20,000,000 birds—as is now usual.

Beef and veal production was a record; mutton and lamb was slightly below the previous year's record output; and production of pigmeats and bacon and ham were about average.

DAIRY PRODUCTS

Wholemilk production was 298,000,000 gallons; a fall of 7 per cent compared with 322,000,000 gallons in 1963-64. This was the first time since 1957-58 that wholemilk production had fallen below 300,000,000 gallons. Drought conditions were the main cause of the decline.

The New South Wales Milk Board continued to increase its wholemilk purchases and used 97,000,000 gallons, about one-third of total supply; as against 92,000,000 gallons in 1963-64.

Factory butter production was about 29,950 tons and cheese production about 4,130 tons. Butter output in 1963-64 was 36,100 tons and cheese output almost 5,150 tons.

EGGS

Commercial egg production reached a record figure of 62,918,000 dozen; 758,000 dozen more than the previous record of 62,160,000 dozen, achieved in 1960-61. Egg production in 1963-64 was 56,713,000 dozen.

WOOL

First-hand deliveries of wool from the 1964-65 clip into the three main broker stores, Sydney, Newcastle and Goulburn, totalled 1,584,563 bales for the twelve months ended June, 1965; slightly less than the 1,606,000 bales in the 1963-64 season but higher than in the two preceding seasons.

Total receivals during 1964-65, including carryover from the previous season and wool received for re-sale, reached 1,696,058 bales. Of these, 1,598,386 bales were sold—about one per cent less than in the previous season.

On excluding 2,387 bales shipped abroad for sale during the season, 95,285 bales were held in store at the end of June, a little more than usual.

The wool price average fell by 16 per cent, to 58.8 pence per lb, from the 70.3 pence per lb received in the previous season.

Total proceeds of sales from the three stores amounted to £116,000,000 during the 12 months. Though this was 23 per cent less than from the season before, it was slightly higher than that obtained from 1962-63.

LIVESTOCK NUMBERS

Sheep and Lambs.—At the end of March, 1965, sheep and lambs in N.S.W. totalled about 72,396,000; about 632,000 more than was so 12 months earlier, and a record.

Sheep numbers had increased by 1,142,000 to 56,896,000 but lamb numbers had fallen by 560,000 to 15,500,000. The proportion of lambs marked (20,477,000) to ewes mated (27,131,000) was 75 per cent, slightly lower than in 1963-64.

Cattle.—Cattle in N.S.W. at the end of March, 1965, totalled about 4,619,000, slightly below the record of 4,789,000 in March, 1964.

Pigs.—The number of pigs in N.S.W. at the end of March, 1965, was about 448,660; about 57,360 more than in March, 1964.

FODDER CONSERVATION

The run of favourable seasons has ended, and this has revived the role of fodder conservation; a profitable "assurance policy" when drought arrives. Because a drought is needed to make conservation a profitable investment, landholders tend to gamble; on seasons, on a hope that agistment will be obtainable in nearby districts, or that aid will be forthcoming from some source.

Early in the present emergency, fodder reserves held on farms were at an all time high. But these have been proved totally inadequate to meet the demands of a major drought. Increased stocking through good seasons, pasture improvement and changes in management outlook has not been matched by fodder reserves.

When this drought started, New South Wales was carrying an estimated 71.8 million sheep and 4.8 million cattle. Known fodder reserve comprised 1.6 million tons hay, and 600,000 tons silage. Grain held on farms was estimated at 14 million bushels.

A large proportion of fodder of all types held on farms was in the central and southern inland districts. The greatest demand for fodder has been from coastal and tablelands districts, where the amount of fodder conserved was low.

Wheat grain is being used extensively for sheep and cattle drought feeding. The Australian Wheat Board is supplying it, from Government Grain Elevators.

In spite of obvious, fodder reserve deficiencies, landholders are in a sounder position to meet the challenge of this than previous droughts. Factors helping them are: low rabbit population; better sub-division, water supplies and pastures; coupled with better management, mechanisation, and facilities for movement of stock; and advancements in fodder storages, resulting in a better quality product. And, not least, greater knowledge of scientific feeding methods.

A striking advance has been made in provision for bulk storage of grain on farms. This has been steadily progressing for several years, and gained impetus in the past season. The fact that official wheat receival centres were unable to accept promptly the increasing large quantities of grain harvested and awaiting delivery, prompted farmers to make alternate arrangements on their properties. Wheat growers have been realistic in their approach to this, and have understood that no grain-receival system could cope with their peak deliveries.

Farm storages for grain, temporary and long term, will expand, and storage methods will improve by experience. In these trends may well be found the overall pattern of fodder conservation sufficient to meet drought needs.

Standing Committee on Drought Relief

In May 1965, the N.S.W. Government appointed a Cabinet Sub-Committee for drought matters. Subsequently a Standing Committee on Drought Relief was created. The Chief of Regional Extension Services, N.S.W. Department of Agriculture, is Chairman of this Standing Committee. Other committeemen are the representatives of the Department of Lands, Conservation, Transport and Decentralisation, and a senior officer of the Treasury. An Economics Research Officer of the Department of Agriculture, Division of Marketing and Agricultural Economics, is Secretary.

Operations of the Standing Committee on Drought Relief have been extensive and continuous. The Government has been kept informed. Submissions have been made regularly to the Minister for Agriculture, on actions that might assist in alleviating the drought.

Actions to assist primary producers affected by the drought included the following:—

- Rail rebates on transport of stock and fodder;
- waiving of payment of 3d. per ton per mile, road transport tax;
- advances amounting to £1,000,000, through dairy products factories, for farm purchases of fodder;
- finance for purchase of wheat for feed;
- subsidised interstate road transport of hay;
- organised transport, receival and distribution of gift fodder;
- free rail and road transport of gift fodder;
- more rail waggons to transport fodder;
- release of crown land for grazing;
- more time for re-payment of rents of Crown leases;
- more expeditious handling of applications for farm water supplies;
- regulated water supplies in drought areas;
- promotion of "drought feeding schools" for landholders;
- fostered rain-making operations.

Flood and Bush Fire Relief Committees

The Regional Extension Services Chief and the Accountant of the Department of Agriculture are members of the N.S.W. Flood and Bush Fire Relief Committees. This year the Flood Relief Committee met 24 times and the Bush Fire Relief Committee 15 times.

Floods occurred on many of the coastal and inland rivers in early June, 1964. Most of these were comparatively minor floods, but major flooding occurred on the Nepean and Hawkesbury Rivers. Notable damage from heavy rains occurred also in other places, including Lithgow.

Hundreds of claims for relief were received by the Committees. Extension officers of the Department investigated the claims. Grants were made in more than 600 cases.

Following the very dry summer fire outbreaks were numerous. Some 12,054 fires were reported. These involved, in all, 2½ million acres—including ¼ million acres of State Forests. Fortunately preventive and control measures were effective in most cases and minimised the damage. But a very serious fire on the southern tablelands in March 1965, affected 300 properties. It devastated 250,000 acres; destroyed 55 homes, 30,000 sheep, 600 cattle, 34,000 bushels of fruit on the trees, and hundred of miles of fencing.

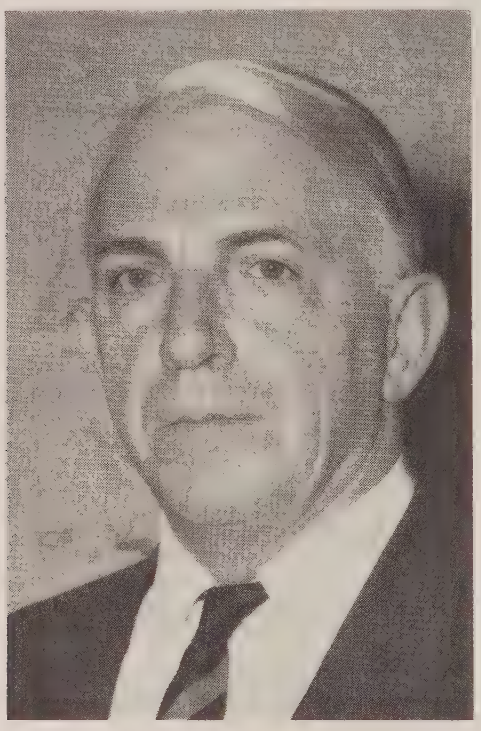
Cloud-Seeding Project

The CSIRO Radiophysics Division has been conducting cloud-seeding research for several years past. The Department has co-operated and, *inter alia*, advised the CSIRO when continuation of cloud-seeding in an area has been thought likely to be detrimental to primary production there.

This year, in view of the dry to droughty conditions prevailing, there have been suggestions from various quarters that the Department should apply cloud-seeding to relieve the position. Arising from this background, the Department has seconded an agronomist to the CSIRO for an intensive training course, to be able to recognise suitable cloud formations and conduct cloud-seeding.

Australian Agricultural Council and Standing Committee on Agriculture

The Australian Agricultural Council and the Standing Committee on Agriculture each had two meetings; one each in July 1964, at Port Moresby; and one each in February 1965, at Canberra. The meetings at Port Moresby were the first held outside the mainland of Australia by these bodies. Many items important to the agricultural industries were discussed at these meetings.



Retired—Dr H. J. Hynes, Director of Agriculture

Director of Agriculture Dr H. J. Hynes, former Chief of the Division of Marketing and Agricultural Economics and former Chief Biologist, joined the Department as a Science Trainee in 1919. He retired on 2nd April, 1965, after 46 years' service to agricultural science and administration through the Department of Agriculture.

Royal Botanic Gardens and Government Domain Trust

The Royal Botanic Gardens and Government Domain Trust met three times this year. The Trustees at their first meeting were able to congratulate Mr H. K. C. Mair on his appointment as Trustee, vice Mr R. H. Anderson, retired; and recorded their appreciation of the services rendered by Mr Anderson over the preceding eighteen years.

Matters discussed this year included: the proposed remodelling of the Domain Baths by the Council of the City of Sydney; restoration of the area in the vicinity of the Domain Car Parking Station; proposed extensions to the Art Gallery of New South Wales; lodgment of an appeal against the rate assessed on the Kiosk site in the Royal Botanic Gardens; and installation of water re-circulation equipment for the Captain Phillip Fountain.

Centennial Park Supervisory Committee

This Committee, formed in May, 1964, met monthly during 1964-65. It is advisory to the Director-General in matters concerning the development of and overall plans for Centennial Park. Dr H. J. Hynes was appointed as Chairman of the Committee whilst he was Director of Agriculture and he is continuing as Chairman in his retirement from the Department.

Appointed Deputy Director-General, Mr R. M. Watts

Mr R. M. Watts, formerly Chief of the Division of Animal Industry was appointed to the position vacated by the retirement of Director of Agriculture, Dr. H. J. Hynes on 2nd April, 1965. The position was re-designated as Deputy Director-General. Mr Watts joined the Department in 1936 as a veterinary officer.

The other members of the Committee are:—Messrs H. K. C. Mair (Director and Chief Botanist, Royal Botanic Gardens); C. R. Grant (Supervisor, Botanic Gardens; and Officer in Charge, Centennial Park); A. Pearson (Chief, Research Stations Branch); and A. H. Nicholson (Premier's Department).

A special vote of £30,000 was expended under the direction of the Centennial Park Supervisory Committee. New Depot buildings were erected; machinery was purchased, the riding-track was restored, pond-clearance was undertaken, and landscaping of a large area was initiated.

Farrer Memorial Trust

Two ordinary meetings and the annual meeting were held. Dr H. J. Hynes, Director of Agriculture (retired), retired also from the Trust. His place as an "official" Trustee is now occupied by Mr R. M. Watts, Deputy Director-General of Agriculture.

Professor C. M. Donald, Professor of Agriculture, University of Adelaide, was presented with the 1964 Farrer Memorial Medal. This was at a special meeting of the Australian Institute of Agricultural Science (New South Wales Branch) on 24th September, 1964, in the University of Sydney Great Hall. Professor Donald delivered the 1964 Farrer Memorial Oration—"The Progress of Australian Agriculture and the Role of Pastures in Environmental Change".

The 1965 Farrer Memorial Medal was awarded to Professor J. R. A. McMillan, Professor of Agriculture, University of Sydney. Professor McMillan chose "Water in Relation to Agricultural Production" as the title for the Oration. The Medal will be presented and his Oration will be delivered during the 38th A.N.Z.A.A.S. Congress at Hobart, in August, 1965.

The 1964 Farrer Memorial Research Scholar, Mr M. R. Krause departed from Sydney on 11th July, 1964, to study, at the Washington State University, U.S.A., wheat-breeding problems and modern methods of pure seed production. Trustees have received Mr Krause's first six monthly report with great interest. Applications for a future Scholarship have been invited.

Trustees have been extremely interested to learn this year that the first Farrer Memorial Medal, presented to the Rt Hon. J. A. Lyons, M.P., Prime Minister of Australia, at a ceremony at Queanbeyan on 3rd April, 1936, had been donated to the Adolph Basser Library, Canberra. It is on display there.

The Auditor-General audited the accounts of the Trust, and the Balance Sheet at 31st December, 1964 was certified as correct.

Retirement of Director of Agriculture, Dr H. J. Hynes

Dr H. J. Hynes retired in April, 1964, after almost 46 years in the New South Wales Public Service.

He joined the Department as a University Trainee in Agriculture, University of Sydney, in 1919. After further studies in the United States he joined the Biology Branch. He became Chief Biologist in 1940.

During the 1939-45 war he was seconded to Premier's Department, as administrative officer for the State War Effort Co-ordination Committee. Later he was Assistant Director of Rural Manpower in the office of the Director-General of Manpower, Sydney.

After this he became the first Chief of the Department of Agriculture Division of Marketing and Agricultural Economics, in 1943. In 1947 he was appointed Assistant Director of the Department, and in 1959, Director of Agriculture.

Dr Hynes' many appointments included membership of the Poultry Advisory Board, the Wheat Industry Research Council, and the Fauna Protection Panel.

He is a past President of the New South Wales Branch of the Australian Institute of Agricultural Science and a life member of the Royal Society of New South Wales. He was the first Editor of the Journal of the Australian Institute of Agricultural Science.

Appointment of Mr R. M. Watts as Deputy Director-General, vice "Director of Agriculture"

Mr R. M. Watts has been appointed to the newly constituted position of Deputy Director-General of the Department of Agriculture. He succeeds Dr H. J. Hynes, who retired in April, 1964, as Director of Agriculture.

Mr Watts joined the Department in 1936 as a veterinary officer. Subsequently he rose through the positions of District Veterinary Officer and Principal Veterinary Officer to become Deputy Chief of the Division of Animal Industry. In 1960 he became Chief of the Division, and New South Wales Chief Quarantine Officer (Animals).

As Chief of the Division of Animal Industry he was also President of the Veterinary Surgeons' Board, Chairman of the Stock Medicines Board, and Chairman of the Rabbit Control Advisory Committee.

In addition, he was a member of the Poisons Advisory Committee, Animal Production Committee, Cattle Tick Control Commission, Cattle Tick Research Advisory Committee, and the Co-ordinating Committee on Pesticides.

In 1962 Mr Watts was a member of the Commonwealth delegation to an international meeting on pesticides, convened in Rome by the F.A.O. Later he visited the United Kingdom for discussions on animal disease programmes.

Finance—Summary

Consolidated Revenue Fund expenditure and Receipts.—Expenditure from Consolidated Revenue Fund in 1964-65 was £5,266,382. This included £915,723 for Cattle Tick Control on the North Coast and £213,797 for the upkeep of the Royal Botanic Gardens and Admiralty House, some of which expenditure is recouped from the Commonwealth Government.

Further details in support of the Consolidated Revenue Fund expenditure by other Government Departments on behalf of the Department of Agriculture, are shown in the Public Accounts tabled in Parliament each year as an accompaniment to the Report of the Auditor-General.

Receipts from all sources totalled £2,878,279 and are shown in some detail later in this report. (Appendix 1—The Accounts of the Department of Agriculture, 1964-65.)

Capital Works.—Capital works to the value of £259,898 were constructed and a loan programme of £200,000 has been prepared for 1965-66. Details of the loan work expenditures are shown in Appendix 1—The Accounts of the Department of Agriculture, 1964-65.

Trust Funds.—The provision of funds by industries, semi-government bodies, Commonwealth Government grants and specialised taxations continues to show the upward trends of recent years. Substantial sections of the research programmes have been financed by these means and findings have been extended to the primary producers and others with the help of special Commonwealth grants (*vide* "Commonwealth Extension Services Grant" and "Commonwealth Dairy Industry Extension Grant").

Expenditure from such grants or trusts is handled through the "Special Deposits Accounts" at the Treasury and regulated either by Act of Parliament or by such directions as may be given by the donor body, to whom the Department of Agriculture must account at the close of each financial year.

Some of the more important aspects of the operations on the Special Deposits Account are given in Appendix 1—The Accounts of the Department of Agriculture.

Commonwealth Grants for Extension Services

The Commonwealth Government, through the Minister for Primary Industry, has expressed intention to revise in 1966 the terms and conditions of the Commonwealth Extension Grants to the States. Already the intention has been discussed at Australian Agricultural Council meetings, and at meetings in 1965-66 plans will be made and submitted to the States for consideration. The amount of the Grants to the States, at present £650,000 per annum, are likely to be increased. Also they will be combined as one Grant, and the scope for usage of the funds will be extended to include applied research.

AGRICULTURAL EXTENSION SERVICES GRANT

The Commonwealth Extension Services Grant of £300,000 per annum terminated on 30th June, 1965. Applications by the States to the Commonwealth to increase this Grant and to extend it for a further five-year period were not approved, because of the Commonwealth intention to alter the conditions of the Grant and combine it with the Commonwealth Dairy Industry Extension Grant. However, the Commonwealth approved continuation of the Grant for one year to 30th June, 1966, at the existing rate. Thus, New South Wales will receive £75,000 for 1965-66.

The Agricultural Extension Services Grant was made first in 1952. The amount has varied between £250,000 and £350,000 per annum—as a total to all States. At present it is £300,000. Of this, New South Wales receives £75,000 per annum. Total expenditure from these funds by the New South Wales Department of Agriculture from 1952, to 30th June, 1965, has been £840,586.

The effects of the funds are apparent in the reports of the various Divisions and Branches, within this Annual Report of the Department.

DAIRY INDUSTRY EXTENSION GRANT

This Grant has been used by the States to improve advisory and allied extension services in the dairying industry. It commenced in 1948, and was renewed for five-year periods that would normally end on 30th June, 1968. Annual allocation to New South Wales is £89,000.

Like the Agricultural Extension Grant in its effects, the Dairy Industry Extension Grant has proved invaluable to New South Wales in providing funds for demonstrations on farms, employment of additional staff for extension services (in dairying districts), and extension aids for officers.

The total amount of the Grant to New South Wales from 1948 to 30th June, 1965, has been £1,123,480.

By combining these funds with the Agricultural Extension Grant funds (£840,586) it is apparent that near to £2 million has been made available to New South Wales by the Commonwealth since 1948, to help develop the farm advisory services.

Industry Funds for Research

The Department received approximately £300,000 this year from the various industry, levy funds. It supported expansion of research. Shortage of agricultural graduates for the research prevented full use of the total funds available.

The 1964-65 allocations from Industry Research Funds were as follows:—

WHEAT INDUSTRY RESEARCH COMMITTEE FUNDS

Wagga Agricultural Research Institute Projects.—Agronomic survey (£7,500); breeding of improved wheat varieties for irrigation areas (£2,400); soil fertility (£1,100); skeleton weed (£700); genetic analysis of maturity (£1,800); glasshouse for cytogenetic investigations (£6,000); solarimeter (£200).

Tamworth Agricultural Research Station Project.—Temperature control in glasshouse (£2,300).

Condobolin Agricultural Research Station Project.—Wheat research for central west (£10,000).

Temora Agricultural Research Station Project.—Wheat breeding (£900).

WHEAT INDUSTRY RESEARCH COUNCIL FUNDS

Tamworth Agricultural Research Station Projects.—Photoperiod and temperature studies (£3,588); improvement of Durum wheat varieties (£950); overseas travel in connection with world wheat collection (£1,250).

Chemistry Branch Project.—Wheat grading survey (£3,230).

Biology Branch Project.—Yellow Dwarf virus (£420).

Division of Marketing and Agricultural Economics Projects.—Economics of segregation and storage of wheat (£2,850); bibliography of agricultural economics (£750).

WHEAT INDUSTRY STABILIZATION (DISPOSAL) FUND

The projects referred to in the 1963-64 Annual Report were continued; except that the £9,500 set aside for purchase of additional land for the Agricultural Research Institute, Wagga, has been cancelled and the £5,000 allocated for purchase of mobile equipment for nutrition and plant breeding at the Agricultural Research Station, Tamworth, has been increased to £7,000.

New projects approved by the Minister for Primary Industry were as follows:—at Wagga Agricultural Research Institute: Wheat drought resistance research (£7,000) and Purchase of environment control cabinets for genetic studies (£4,000); at Cowra Agricultural Research Station: Purchase of mobile equipment for central west plant nutrition research (£8,275).

A total of £105,652 was available in this fund at 30th June, 1964. On 30th June, 1965, the available balance was £90,740. Of this, £84,000 was invested.

WOOL INDUSTRY RESEARCH COMMITTEE FUNDS

Trangie Agricultural Research Station Projects.—Efficiency of wool production (£6,950); Influence of season on ram fertility (£600); Fleece measurement for selection of stud merino rams (£7,000); and Comparison of management systems (£1,750).

Entomology Branch Projects.—Sheep blowfly (£1,750); Black soil scarab (£1,200).

Shannon Vale Nutrition Station Project.—Relative efficiency at several stocking rates and superphosphate levels (£2,900).

Yass Valley Projects.—Adaptive pasture research, Southern Tablelands (£5,240); Vital statistics of Yass Valley merino flocks (£2,700).

Wagga Agricultural Research Institute Projects.—Incidence and prophylaxis of ewe infertility due to sub-clover ingestion (£2,700); Effect of pasture management and time of lambing on wool and lamb production (£2,900).

Bathurst Agricultural Research Station Project.—Aerial control of Serrated Tussock on the southern tablelands (£2,000).

Temora Agricultural Research Station Project.—Effect of rates of stocking and superphosphate applications on productivity of merino ewes on improved pastures (£2,000).

AUSTRALIAN CATTLE AND BEEF RESEARCH COMMITTEE FUNDS

Grafton Agricultural Research Station Projects.—Pasture species investigations with particular reference to summer legumes (£5,650); Phosphate levels in north coast soils (£7,000); Winter feed, north coast beef areas (£3,650); Sod seeder development (£2,000).

Tamworth Agricultural Research Station Project.—Major and minor element deficiencies in beef area soils (£1,940).

Leeton Agricultural Research Station Project.—Pasture intake and digestibility studies (£6,388).

Glen Innes Agricultural Research Station Project.—Winter nutrition on the northern tablelands (£3,000).

Trangie Agricultural Research Station Project.—Beef cattle improvement through breeding methods (£8,740).

Division of Marketing and Agricultural Economics Project.—Nature and organisation of the Australian beef cattle industry (£2,280).

Biology Branch Project.—Inoculation of summer legumes (£2,154).

Glenfield Veterinary Research Station Project.—Incidence, importance and control of cattle parasites (£2,220).

AUSTRALIAN DAIRY PRODUCE BOARD FUNDS

Wollongbar Agricultural Research Station Projects.—Socio-economic investigations (£6,564); Pasture species research (£5,101); Other pasture and animal research (£8,229); Flood irrigation research at Mooneba (£1,900).

Hawkesbury Agricultural College Projects.—Efficiency of detergents and sanitisers (£2,575); Milking machines and mastitis research (£690); Composition of milk (£5,853).

Biology Branch Project.—Bacteriophage-Antibiotic Interactions (£200).

TOBACCO INDUSTRY TRUST ACCOUNT

Glen Innes Agricultural Research Station Projects.—Expenses for current research and extension at Glen Innes and the adjacent tobacco growing areas (£42,060); Purchase of land for and establishment of Ashford Research Station (£40,691).

BANANA RESEARCH ADVISORY COMMITTEE

Research into mixed ripe bananas, packaging and ripening, plus staff and travelling (£2,805).

Research Liaison Office

Progress of individual research projects is reported elsewhere in this Annual Report by the various Divisions and Institutions directly responsible for their research programmes.

Scope.—The Chief Research Liaison Officer is responsible to the Director of Agriculture for improvement of existing research, stimulation of new research programmes, and co-ordination and integration of research—especially when the subject matter concerns more than one Division. He helps also to ensure that the results of research are represented effectively. He has a specific responsibility to stimulate, and present for consideration, research projects likely to attract industry funds for research.

Research Programme Committees.—Programme committees covering the beef cattle, cotton and dairying industries have continued to operate. Assessment of the work of the three initial committees would as yet be premature.

A.D.P. Section.—The Automatic Data Processing Section now comprises a Systems Officer and two programmers. The Section continued to have the part-time assistance of one member of the Public Service Board's A.D.P. Division.

The most notable achievement of the Automatic Data Processing Section during the year was the study, design and implementation of a computer system for proving the worth of dairy bulls for breeding purposes. As far as is known, this has not been done on such a large scale anywhere outside the United States of America.

A total of 5,957 bulls were surveyed on all available daughters' production records over a two year period, and the results were printed in about 20 hours' computer time. This contrasted with 204 bulls surveyed on 10 per cent of available records, using manual methods, over several years up to 1962.

Wagga Agricultural Research Institute Additions.—The extensions to the Institute building will be completed within the next few months. Only minor work remains, including installation of electrical wiring, temperature control and ventilation equipment, and provision of chemical facilities.

Tamworth Agricultural Research Station Developments.—Appointment of additional staff made possible the commencement of work on three additional projects: wheat quality investigations, Durum wheat breeding, and plant nutrition research.

Research Liaison Officer (Science Publications).—This appointment in Division of Information Services is having a pronounced effect in stimulating officers engaged in research to produce more material for publication.

"Research and the Farmer"—Regional Publication Series.—The third issue in this series of publications is now being printed. It deals with research done in North Coast Region. A fourth issue, dealing with research in South Western Region, is being prepared. Each of the first two issues was for Southern Region.

Developments at the Agricultural Colleges

Commonwealth Technical Scholarships and Other Financial Aid for Technical Education.—A few of the Commonwealth Technical Scholarships awarded in 1965 were allocated to Hawkesbury and Wagga Agricultural Colleges; actually—16 to Hawkesbury College, and 9 to Wagga Agricultural College.

The N.S.W. Department of Technical Education administered the approximate £1,800,000 received by N.S.W. in 1964-65 as Commonwealth financial assistance in terms of the State Grants (Science Laboratories and Technical Training) Act, 1964. Only £31,620 of the £1,800,000 was allocated to and shared by Hawkesbury Agricultural College and Wagga Agricultural College.

The allocation enabled significant improvement in equipment and facilities for training students. But, towards securing in future a more reasonable share for the Agricultural Colleges, a case has been prepared for Commonwealth consideration.

Independent Final Examinations for Hawkesbury and Wagga.—Commencing with the 1965 Final Examinations in the Diploma in Agriculture Course, the Hawkesbury and Wagga Agricultural Colleges will examine independent of each other. But there will be supervision of standards, through an external assessor for each subject.

Enrolments Under the "Old System" have Ceased.—Enrolments under the old system for the Agriculture and Dairy Technology Diploma Courses have now ended. As from and including the 1966 academic year, the new entrance standards and enrolment procedure outlined in the 1963-64 Annual Report will apply.

Yanco Research Station Renamed—as an Agricultural College.—"Yanco Agricultural College and Research Station" is now the name of the former Agricultural Research Station where, since 1963, a one-year Farm Certificate Course is conducted for farmers' sons and others who intend to go on the land as owners or managers.

Accommodation for Farm Certificate students has been gradually increased. The intake in 1963 was 38 students; in 1964 it was 55, in 1965 it was 85 and in 1966 the intake could be 102 students.

Some Notable Developments

CONCERNING LIVESTOCK

New, District Veterinary Laboratory—Armidale.—Towards the end of the year, the newly established District Veterinary Laboratory, Armidale, was opened. This laboratory represents the first stage of the programme for decentralisation of the veterinary laboratory services previously confined to the Veterinary Research Station, Glenfield.

The Armidale Laboratory will receive diagnostic specimens from the areas of the Armidale and the Narrabri District Veterinary Officers.

Cattle Tick Again in Grafton Area.—The finding of cattle tick in the Grafton area from which this parasite was believed to have been eradicated, necessitated the re-gazettal of this area. The source of the infestations was not discovered.

Expansion of Tuberculosis Eradication Scheme.—The programme for eradication of bovine tuberculosis was advanced a stage further by gazettal, under the Stock Diseases Act, of eighteen more quarantine areas. These bring the total to sixty-nine gazetted quarantine areas, and the number of cattle to about 1,316,000.

Drought conditions led to fewer cattle being tested, compared with the previous year, but 629,228 were tested. Incidence of reactors was 0.38 per cent.

Swine Fever—Again No Outbreak.—For the second successive year no incidence of swine fever was recorded.

Provision for Apiculture Research.—For the first time, the Department has a Livestock Research Officer to undertake and specialise in research into the breeding, nutrition and diseases of bees. The appointment was made this year.

Expansion of Recording for Dairy Herd Improvement.—Recording of the dairy animals' milk and butterfat production is the basic means of providing dairy farmers with information on which to base a herd improvement breeding plan. Each year the number of dairy farmers seeking this service increases.

The total of cows under official test was 12,300 this year; compared with 11,300 in 1963-64; and in group recording there were about 73,000 cows, compared with 70,000 in 1963-64. Ten more recording units are required at present, to record another 10,000 cows.

Automatic Data Processing re Herd Recordings.—Difficulties in the changeover to automatic data processing have been solved and the backlog has been overcome. All results have been circulated to farmers and District officers. It is now certain that the 1964-65 results will be processed much more rapidly than were the records from previous two years.

Automatic Data Processing re Bull-Proving.—A notable achievement of the Automatic Data Processing Section this year was the study, design and implementation of a computer system to prove the worth of dairy bulls for breeding purposes. As far as is known, this has not been done on such a large scale anywhere in the world, unless in the U.S.A.

Near to 6,000 bulls were surveyed, on all available production records for their daughters over a two-year period. The results were printed in about twenty hours' computer time. This contrasts with a total of 204 bulls so surveyed, using manual methods on 10 per cent of available records, in a period of years up to 1962.

CONCERNING PASTURES

Increased Pasture Seeds Industry.—The value of pasture seed production has continued to rise; 1964-65 production, 2,550 tons, was valued at about £850,000. Farm interest in seed production has increased.

Release of new varieties of pasture plants and their acceptance by the N.S.W. Herbage Plant Liaison Committee has created a demand for further certification schemes. Brignoles and Currie Cocksfoot and Seedmaster Phalaris have been added to the list of varieties being certified this year.

Farmers' interest in pasture seed production as a specific cash crop enterprise has grown. Extensive in-row areas of perennial grasses have been planted, to allow for inter-row cultivation. Use of nitrogenous fertilizers by seed producers has also increased, to boost seed yields per acre.

A twenty minutes colour film on seed certification has been completed for the Department, and with the Department's technical direction, by the Commonwealth Film Unit. This film has been favourably received as a medium for local extension and for promotion of export seed sales.

Pasture Revolution on the North Coast.—The year has been notable for increased acceptance of the new, sub-tropical pasture species and "feed-year" concepts on the far north coast.

Despite the adverse 1965 climatic conditions the area sown to sub-tropical pastures species increased from 1,500 acres in 1963-64 to 8,000 acres in 1964-65. In Tweed and Byron Shires the total increased from 550 to 3,550 acres. In the Kyogle and Lismore districts, the sowings totalled 2,900 acres, comprising Silverleaf Desmodium 650 acres, Greenleaf Desmodium 100 acres, Glycine 1,250 acres, Siratro 300 acres and Dolichos lab lab 600 acres.

The adverse seasonal conditions prevented the occurrence of more spectacular increases in acreage, but at the same time they demonstrated the drought-hardiness of the sub-tropical pasture species.

CONCERNING CROPS

Applied, Wheat Fertilizer Research.—This research was extended to cover more adequately all main sections of the wheat belt. A factor contributing to record wheat production was the marked increase in fertilizer usage.

Through earlier research, superphosphate was applied on many paddocks not previously fertilized and at heavier rates in regions where the soils have been shown to be low in soil phosphorus. Superphosphate usage has increased spectacularly in the north-west where little was used before; and rates per acre have markedly increased in central and southern wheat acres.

Nitrogenous fertilizers were used on many wheat crops for the first time—in association with superphosphate.

Breeding for Frost Resistant Wheats.—Using special methods developed at the Agricultural Research Station, Tamworth, a programme for breeding frost-resistant wheat varieties has been launched there.

Varieties imported from Mexico have been found to combine earliness, cold tolerance and rust resistance. These have been crossed with local strains. The progeny will be selected under artificially produced conditions of frost.

New Oat Variety Released.—A new oat variety was named and released, early in 1965. The new variety is "Bundy". It was developed at the Department's Glen Innes Agricultural Research Station. It is expected to replace gradually in northern New South Wales the variety Avon for grain, and the variety Belar for light grazing and grain.

Rice—Again Production Records.—Continuing its unsurpassed efficiency, the rice-growing industry established a new record—the fourth in four consecutive years—by producing at least 150,000 tons. This record arose in part from increased acreage. On the Coleambally Irrigation Area an increase of 1,000 acres was recorded, compared with 1963-64.

Rice—New Varieties Released.—The demand for a long-grained rice to take some of the acreage of the short-grained, standard rice Caloro II had been met in some measure by the long-grained indica type Bluebonnet 50. But the inferior yields and field performance of Bluebonnet 50 have forced the provisional release (for seed production) of two uniform bulked selections of a Bluebonnet 50 x Calrose cross. By fulfilling their promise these will replace Bluebonnet 50. They will yield higher and perform more reliably than that variety.

The extensive programme of breeding and selection proceeding at Yanco Agricultural College and Research Station ensures a reserve of material from which to select further superior strains.

Cotton Growing Increased Again.—The value of the 1964-65 crop is at least £3,000,000. The 18,000 acres of cotton harvested this year was 2.3 times the area harvested in 1963-64, and yielded at least 31,000 bales—about 70 per cent of Australia's total production of ginned cotton. Yield average this season was 1.8 bales per acre in the Narrabri-Wee Waa area. Some crops there yielded 2.0 bales and some as high as 2.7 bales per acre. Moreover, the premium grade cotton was superior to world average; it had a staple length of more than 1.125 ins.

Release of New Vegetable Varieties.—Continued success in the Department's vegetable breeding programme is exemplified by the release of two new tomatoes, four new beans and three new peas this year.

The two tomatoes are resistant to *Fusarium* wilt, the major limitation on high yields in furrow-irrigated crops. The new varieties should stabilise the processing industry in the M.I.A. by increasing the production of tomatoes needed for processing.

The four bean varieties are fully resistant to root-rot which has menaced western areas' production of beans for processing.

The three pea varieties are early maturers. Two of them produce the uniformly small pea sought for quick freezing.

Increased Disease-Free Potato Seed.—Good progress was made in producing commercial quantities of potato seed free of leaf roll and other virus diseases. Virus leaf roll has been particularly troublesome in the last four seasons because of the prevalence of the aphid vector.

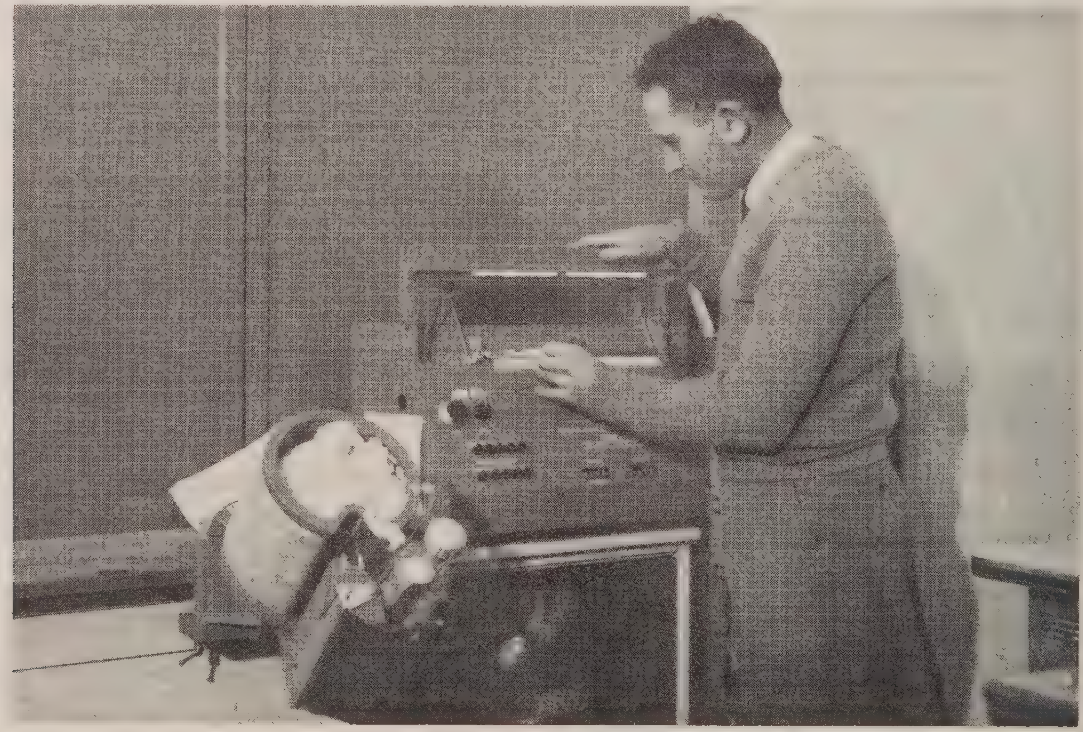
In order to establish stocks free of virus, the progeny of single plants from the crops of the best growers in each tableland district were obtained in 1960 and these have been grown on as clonal selections. By tuber unit planting, rigid culling and a strict spray programme to control aphids, the disease has been eliminated from selected lines. At the same time all varieties have been selected for purity of type and high yield.

Considerable high-quality, disease-free seed of the leading commercial varieties has now been produced. With one further year of reproduction, there will be sufficient seed to permit supply to commercial seed growers.

CONCERNING WEEDS AND PESTS

Noxious Plants Advisory Committee Established.—In February, 1965, the Noxious Plants Advisory Committee was established by the Government, comprising: an officer respectively of the Department of Agriculture (Chairman), Department of Local Government, and Department of Lands; and two representatives of the Shires Association—including one who is a member of a Weeds County Council. Four meetings have been held.

The Committee will report and recommend to the Government on any matter relating to noxious plants generally; review noxious plant policy regularly and make recommendations; recommend to the Government annually the principles upon which grants should be made available to Councils; recommend any amendment of law relating to control of noxious plants; carry out advisory and educational functions; provide an avenue for Local Government and primary producers to contribute to noxious plant policy and its implementation; and will co-ordinate the activities of and improve liaison between landholders, Councils and the Government.



Testing Cotton Fibre Quality—by Digital Fibregraph

The testing has shown that N.S.W. cotton quality is superior to world average. N.S.W. cotton acreage has increased from 97 in 1959 to 18,000 acres in 1964. North Western yields, some as high as 2·7 bales, averaged 1·8 bales per acre

Indian Hemp (Marihuana) Eradication.—After an infestation of Indian hemp or marihuana was discovered in the Lower Hunter area in the spring of 1964, the Government directed the Department to eradicate the infestation. Departmental officers, contractors and casual employees were used to locate and treat all infestations. Under the dry seasonal conditions which existed at the time, amitrole proved to be the most satisfactory herbicide while atrazine was added to give residual control of seedlings in most areas treated. It is believed that no plants set seed during the season.

Skeleton Weed, Pre-emergence Control in Oats.—A pre-emergence application of the herbicide picloram (1 oz active ingredient per acre) has kept skeleton weed competition out of a crop of oats for as long as six months. There was a yield increase of about 10 per cent; compared with standard, post-emergence treatments.

The pre-emergence application of picloram has the great advantage over pre-sowing application that it does not interfere with normal, seed bed preparation.

Whole-town, Fruit Fly Control.—Country town control of Queensland fruit fly by organised and systematic whole-town treatment continued to demonstrate the efficiency of recommended treatments. Success of the scheme in the Murrumbidgee Irrigation Area is now reflected by the lifting of quarantine conditions involving commodity treatment of fruit intended for export interstate and to New Zealand. This has removed an additional marketing cost, such as was incurred when 68,000 bushels of oranges had to be fumigated last season for export.

Narrandera and Leeton have now been free from infestation since 1960. Broken Hill and Menindee have had two years' freedom. Other treated towns where infestation was not recorded last season include Hillston, Corowa, Cobar, Griffith, Nyngan, Condobolin and Quirindi.

Towns under initial treatment include Dubbo, Forbes, Parkes, Wellington, Richmond, Boggabri, Bourke and Narromine. These have recorded reduction from epidemic to only light infestations.

The scheme has been proved practical and economic. This has engendered greater public appreciation and support in the towns. The co-operation of Shire and Municipal Councils and industry organisations has been effective and appreciated.

Continued expansion of the scheme through other Councils is certain. Consideration now has to be given to means of coping with this expansion, beyond the present resources of Division of Horticulture.

Pest Control by Ultra-Low Volume Aerial Spraying.—Wingless grasshopper infestations in pasture were controlled by aerially applying only 8 fluid ounces of technical grade malathion per acre, in an undiluted form.

An ultra-low volume spraying method was used. This is new in Australia. It promises control of various other pests of pastures and field crops. There are some very important implications. Considerable reduction in costs because of the low rate of application is one. Another is advantage of low toxicity and residue hazards through the much lighter rate of malathion application.

Personnel and Staff Branch

New Salary Agreements.—Seven new Agreements affecting salaries of Departmental officers were received, and the necessary adjustments of salaries were made.

Salary Determinations.—The Public Service Board determined seven new rates of pay in respect of certain Departmental officers, and salary adjustments were made accordingly.

125 *New Positions.*—125 new positions were created, compared with 164 in 1963-64 and 76 in 1962-63. The details are as follows:—

	New Positions Created	
	1963-64	1964-65
Professional Division	50	27
Clerical Division	22	13
General Division	92	85
	164	125

Total of Officers Employed.—The total of officers employed under the authority of the Public Service Board, as distinct from Ministerial employees (881), increased from 2,384 at 30th June, 1964, to 2,492 at 30th June, 1965.

Staff Numbers at 30th June, 1965

	Public Service Board	Ministerial	Totals	Casuals included in Ministerial
Central Administration	612	8	620	..
Division of Science Service	155	..	155	..
Division of Plant Industry	201	..	201	..
Division of Horticulture	181	..	181	..
Division of Dairying	217	..	217	..
Hawkesbury Agricultural College	63	90	153	..
Wagga Agricultural College	33	69	102	..
Research Stations	252	203	455	12
Division of Animal Industry—				
Head and District Offices ..	284	13	297	..
Queensland Border........	60	..	60	..
Tick Quarantine Areas	66	469	535	1
Meat Inspection Service ..	215	18	233	..
Royal Botanic Gardens	153	11	164	5
Totals	2,492	881	3,373	18

STAFF CHANGES AND MOVEMENTS

Appointments/Promotions.—Mr R. M. Watts, Deputy Director-General of Agriculture; Mr F. Autry-Hall, Assistant Principal Agronomist (Extension); Mr W. J. C. Hudson, Assistant Principal Agronomist; Mr L. R. Kavanagh, Principal Agronomist (Research); Mr T. E. Kitamura, Principal Agronomist; Mr B. O. French, Chief, Division of Horticulture; Mr R. A. Hall, Chief, Division of Animal Industry; Mr N. K. Golding, Deputy Chief, Division of Animal Industry; Mr D. G. Christie, Principal Veterinary Officer; Mr J. S. Healey, Principal Veterinary Officer (Extension); Mr D. W. Crowfoot, Chief, Division of Dairying; Mr C. E. Chapman, Deputy Chief, Division of Dairying; Mr R. T. Laffan, Special Dairy Officer, Divison of Dairying; Mr D. R. Scott, Principal Dairy Officer, Division of Dairying; Mr J. K. Long, Principal Fruit Officer (Research), Division of Horticulture; Mr D. J. McGillivray, Botanist, Royal Botanic Gardens.

Retirements.—Mr H. J. Chardon, Accountant; Dr H. J. Hynes, Director of Agriculture; Mr C. K. Vears, Principal Agronomist (Pastures); Mr H. Harrison, Dairy Officer; Mr H. Grantham, Regional Supervisor; Mr A. Small, Chief, Division of Dairying; Mr A. E. Vincent, Fruit Officer; Mr F. A. Vernon, Principal Dairy Officer; Mr J. D. McGibbon, Deputy Chief, Division of Dairying.

Deaths.—Mr A. Moffat, Cattle Inspector; Mr A. A. Hackshall, Meat Inspector; Mr D. F. Filan, Rural Science Trainee; Mr DeAbrera, C.R., Laboratory Assistant.

Departed for Overseas.—Dr Grahame Edgar, Director-General, visited Port Moresby in July, 1964 to attend the 72nd Meeting of the Standing Committee on Agriculture and the 61st Meeting of the Australian Agricultural Council.

Mr J. C. Keast, Director of Veterinary Research, departed on 27th May, 1965 to attend an International Meeting on Hog Cholera and African Swine Fever in Rome. He will also attend the Commonwealth Agricultural Bureaux Review Conference in London, and visit various laboratories and institutions in Europe, the United Kingdom and the U.S.A.

Dr S. L. Macindoe, Chief Research Liaison Officer, proceeded overseas on 26th April, 1965 on recreation and extended leave. He will take opportunities to investigate and study agricultural matters in other countries.

Mr W. J. Greenhalgh, Fruit Officer, left on 5th May, 1964 to undertake a Ph.D. course of study at Cornell University, New York. He will be away for up to three years.

Dr C. J. Magee, Chief, Division of Science Services, visited Western Samoa in September, 1964, to investigate "Bunchy Top" disease there. Dr Magee again left on 17th June, 1965, to attend the Commonwealth Agricultural Bureaux Review Conference in London.

Mr L. A. S. Johnson, Botanist, attached to the Royal Botanic Gardens, attended the opening of the new Herbarium, at Lae, New Guinea, in May, 1965.

Mr R. T. Malcolm, Plant Inspector (Machinery), visited India in April, 1965 to accept a temporary appointment with the Food and Agriculture Organisation of U.N.O.

Mr E. M. Matheson, Senior Research Officer, visited the U.S.A. from March to June, 1965, to investigate latest developments in American hybrid wheats, improvement of Durum wheats, and the World Wheat Variety Collection.

Mr W. H. Smith, Inspector, Plant Diseases Act, departed on 27th May, 1965, on loan to the Western Samoan Government for about two years to undertake control of "Bunchy Top" and improve the Western Samoan banana industry.

Mr G. F. Donaldson, Economics Research Officer, left on 15th March, 1965 to undertake studies and accept an Assistant Lectureship at Wye College, London.

Mr A. B. Spurrs, Seeds Officer, visited New Zealand in November, 1964 for a course in seed testing sponsored by the International Seed Testing Association and the Colombo Plan Organisation.

Mr R. L. Colman, Agronomist, departed on 12th December, 1964 to attend the 9th International Grassland Congress in Brazil and later visit research stations and centres in South Africa, the United Kingdom, Trinidad, Jamaica and the U.S.A. He returned to Sydney on 7th March, 1965.

Mr W. T. Atkinson, Principal Agronomist (Pastures), departed on 10th November, 1964 to attend the 9th International Grassland Congress, and later visit Central and South American countries, Uruguay, Argentina and southern U.S.A. to collect pasture plant material and study current trends in pasture research developments. He returned to Sydney on 17th May, 1965.

Returned from Overseas.—Mr K. E. Hutton, Plant Pathologist, returned on 22nd October, 1964 from a period at the East Malling Research Station, England and visits to other research centres in England and the Netherlands.

Dr F. C. Butler, Principal, Wagga Agricultural College, returned on 2nd November, 1964 after attending the 7th Commonwealth Mycological Conference on Plant Pathology in London and the Xth International Botanical Congress at Edinburgh, and visits to Agricultural Colleges and Institutes in the United Kingdom.

Mr P. C. Hely, Chief Entomologist, returned on 5th September, 1964 after attending the 12th International Congress on Entomology in London, and visits to South Africa, Israel and the U.S.A.

Mr N. K. Golding, Principal Veterinary Officer, returned on 18th August, 1964 after attending a special course on exotic and other diseases at Grosse Ile Experiment Station in Canada, and vists to Research Institutes in America, Canada, Great Britain and South Africa.

PERSONNEL WORK

Inductions.—Officers and employees taking up duty through head office were suitably inducted.

University and College Trainees.—63 new trainees were appointed at the beginning of 1965, for study at the Universities of Sydney, New South Wales and New England, and at the Wagga and Hawkesbury Agricultural Colleges.

The trainees attended an Induction School covering a ten day period. They spent seven of the days in residence at Bathurst. This is the first time Agricultural College trainees have attended the Induction School, conducted each year since 1962. They are to attend each such future School.

There are now 194 Department of Agriculture trainees at the various Universities and Agricultural Colleges; including ten who are repeating an academic year at personal expense.

Tutorials for In-service Examinees.—Several clerical officers are undertaking the Regulation 116 Training Course organised by the Sydney Technical College for the Public Service Board. Classes were organised for Regulation 119 candidates. Field officers were advised, in preparation for Regulation 124 examinations. Study material was made available to all candidates.

Study Leave.—This was arranged for numerous officers, for part-time University or Technical College courses.

Counselling and Adjustment.—Advice and guidance were provided for a number of officers. In appropriate cases the officer was referred to specialist officers at the Public Service Board.

First Aid Service.—This was continued at head office. Provision of first aid equipment for country institutions was supervised.

Career Inquiries.—Information concerning careers in agriculture was provided to career advisers, parents, students and interested organisations. Appropriate Departmental publications were supplied.

Colombo Plan and other Fellows.—Under the Colombo Plan, the Special Commonwealth Assistance Plan, the Food and Agriculture Organisation, and the Australian International Awards Scheme, training was provided for three groups of Fellows and for individual Fellows from Pakistan, India, Laos, Philippines, Iran, Vietnam, Korea, Malaysia, Singapore, Thailand, Ghana, Tanzania and the United Arab Republic. One Fellow from Malaysia is currently enrolled at Wagga Agricultural College and another, also from Malaysia, is to enrol at the start of the next course.

Legal and Registration Branch

ACTS PASSED

Meat Industry (Amendment) Act No. 43.—This Act amended the Meat Industry Act, 1915-1964, in the following respects:—

(1) To enable the Department of Agriculture to undertake, in certain circumstances, responsibility for meat inspection where this service is provided by the Council of a Local Government Area or County District at any abattoir licensed under the Act and the Council applies for transfer of the service.

(2) To extend the circumstances in which meat inspectors transferred in 1952 from the Metropolitan Meat Industry Board to the Public Service may obtain a refund of their contributions to the Metropolitan Meat Industry Board Officers' Endowment Fund.

(3) To enlarge the powers of the Board in certain ways, including: fund borrowing on the open market; storage of perishable food in its cold storage works; without payment of compensation, destruction of any animals found on the Board's property in such a condition that it would be cruel to keep the animal alive; imposition of a charge where a slaughtering order is cancelled or altered less than eight hours before the start of the day specified in the order.

Marketing of Primary Products (Amendment) Act (No. 47).—The objects of the Act are:—

(1) To authorise the making of regulations with respect to:—

  (*a*) ascertaining the quality and prescribing the standards required for commodities marketed in New South Wales, whether produced in New South Wales or elsewhere;

  (*b*) the storage, package, treatment, marketing, grading and delivery of such commodities, whether produced in New South Wales or elsewhere.

(2) To remove the requirement that a producer must be on the State Electoral Roll to be entitled to vote at any poll of producers under the Act, and thus allow unnaturalised primary producers to vote at polls of the Marketing Board.

(3) To make special provision with respect to producers of tobacco leaf, and to the marketing of tobacco leaf when declared a commodity, by:—

  (*a*) extending the definition of "producer" in the Act, to include a person by whom or on whose behalf tobacco leaf is grown pursuant to an oral or written share-farming or partnership agreement;

  (*b*) providing that the producers of tobacco leaf shall be paid the net proceeds of the sale of their own tobacco leaf after deduction of all charges, commission and expenses.

Pastures Protection (Amendment) Act, 1964 (*No.* 70).—This was a general amending Act involving amendments to eight of the ten parts of the Pastures Protection Act, 1934, and including provisions with respect to rating under the Act, increase of rates payable for travelling stock, a special levy in relation to pigs, and restrictions as to the substances that may be used to brand sheep. The major amendments to the Pastures Protection Act were:—

Part II: The power to appoint permit officers was transferred from the Minister to the Pastures Protection Boards and the Crown was required to contribute half of the cost of insurance under the Workers Compensation Act for rangers employed by the Boards.

Part II—Rates: (1) Boards were empowered to levy a rate on pigs to defray expenses incurred in connection with the eradication and control of disease in pigs. (2) Occupiers of ratable land are required to notify the Board within one month, on becoming or ceasing to be an occupier; and provision is made for apportionment of Pastures Protection rates between successive occupiers. Holders of a lease or purchase from the Crown were excluded from liability for unpaid rates levied before the lease was granted on the land purchased. (3) Owners or occupiers must furnish any information required to verify the accuracy of their returns.

Part IV—Travelling Stock: (1) The maximum rates for travelling stock were increased, and the provisions relating to permits and travelling statements strengthened to ensure a more accurate description of the stock concerned. (2) The owner of the stock and the person actually moving shall be liable for a penalty if the stock are moved without a renewed permit and one was required; while the owner alone shall be liable for payment of agistment fees where the stock does not travel the specified daily or average distance. (3) The provisions relating to impounding of stock, and payment of fees for the release of such stock, are expanded and clarified; and provision is made for charging agistment rates where a person is convicted of allowing stock to trespass on a travelling stock reserve.

Part VI: A dingo destruction board may under specified circumstances enter land and take any necessary steps to destroy native dogs.

Part VII: The Board is empowered to require erection of particular types of fencing not only where the land concerned has a common boundary with the travelling stock reserve, but also where the boundary is separated from the reserve only by a road.

Part VIII—Branding and Earmarking of Sheep: The provisions relating to marking the fleece or skin of a sheep make it an offence to use any substance other than raddle, grease and crayon substances registered under the Stock Food and Medicines Act. This provision does not apply to branding with a colour brand.

GAZETTALS

There were gazettals of twenty-seven Regulations, thirty-six Proclamations and eighty-eight Notifications.

PROSECUTIONS

Ninety-five prosecutions were made for offences under the various Acts administered by the Department.

ARBITRATIONS: AGRICULTURAL HOLDINGS ACT, 1941

Three matters were referred to arbitration under the Act.

REGISTRATIONS

Registrations effected during 1963-64 and 1964-65 are compared numerically in this tabulation:—

	1963-64	1964-65
Apiary registrations	4,250	4,850
Potato licences	1,790	1,400
Stock foods	1,763	1,851
Stock medicines	1,581	1,613
Pest destroyers	1,870	1,767
Sheep brands	1,290	2,012
Sheep earmarks	1,549	2,315
Large stock brands	1,598	1,884
Fertilizers	704	852
Farm produce agents	293	297
Veterinary surgeons	503	527
Swine brands	804	1,085
Swine licences	55	140

VETERINARY SURGEONS BOARD

The Board met on 11 occasions, as in the previous year.

STOCK MEDICINES BOARD

The Board met on 13 occasions, compared with 21 in the previous year.

Stock Medicines granted registration	1,613
New Registrations, 272.	
Renewals, 1,341.	
Applications withdrawn	11
Applications refused registration	10
Applications still under consideration	239
Total number of applications received for year ended 30th June, 1965	1,873

Architect Branch

Funds Expended.—From Loan Funds, Consolidated Revenue Funds and Special Grants the amounts expended on new and maintenance work were as follows: Loan funds, £259,898; Consolidated Revenue funds (including Western Division Public Watering Places), £161,672; Special Grants, £30,408.

Work Completed.—This comprised: at *Hawkesbury Agricultural College*, erection of a cottage; at *Wagga Agricultural College*, erection of two cottages, installation of refrigeration equipment in the poultry slaughter house, erection of a cockerel shed, and completion of the swimming pool; at the *Agricultural Research Institute, Wagga*, erection of a glasshouse; at *Bathurst Agricultural Research Station*, installation of a cool room and refrigeration equipment; at *Shannon Vale Nutrition Station*, extension of the shearing shed; at *Grafton Agricultural Research Station*, erection of a beef cattle shelter, and verandah enclosures to cottages Nos 1 and 2; at *Griffith Viticultural Research Station*, erection of a machinery shed, and installation of fruit grading equipment; at *Glenfield Veterinary Research Station*, erection of a guinea pig house; at *Leeton Agricultural Research Station*, erection of a hay shed and a grain shed; at *Narara Horticultural Research Station*, erection of a greenhouse; at *Narrabri Agricultural Research Station*, installation of improved water supply; at *Orange Agricultural Research Station*, erection of a garage; at *Seven Hills Poultry Research Station*, erection of a cockerel shed; at *Tamworth Agricultural Research Station*, completion of installation of cool room equipment, erection of a hay drying shed, and installation of a mill room; at *Trangie Agricultural Research Station*, erection of beef cattle feed stalls; at *Wollongbar Agricultural Research Station*, completion of slaughter house and erection of a hay shed; at *Yanco Agricultural College and Research Station*, construction of students' residential block, erection of a wool classing building; erection of lecture and laboratory building, construction of food preparation room, construction of agronomy shed, alterations to ablution room in north west and south west domitory block, alterations to officers' ablution room in residential block, and installation of cool room refrigeration plant; at *Centennial Park*, erection of machinery shed and security fence; for *Forbes Pastures Protection Board*, erection of insecticide storage shed; for *Wagga Pastures Protection Board*, erection of insecticide storage shed; and at *University of New England, Armidale*, erection of district veterinary laboratory.

Work Still Proceeding.—This comprises: at *Glenfield Veterinary Research Station*, erection of isolation box and remodelling of post-mortem room; at *Narara Horticultural Research Station*, erection of a potting shed, an office and a tractor garage; at *Narrabri Agricultural Research Station*, erection of a cottage; at *Orange Agricultural Research Station*, improved water supply; at *Tamworth Agricultural Research Station*, installation of partitions in a glasshouse, installation of laboratory benches, and mill room air conditioning; at *Trangie Agricultural Research Station*, erection of sheep house; at the *Agricultural Research Institute, Wagga*, additional agronomy laboratories; and at *Yanco Agricultural College and Research Station*, erection of amenities room for farm staff, alterations to sewerage treatment plant, and improved water supply.

Maintenance Work.—This comprised: painting and repairs to cottages and/or farm buildings at Hawkesbury Agricultural College, Wagga Agricultural College, Yanco Agricultural College and Research Station, the Tropical Fruit Research Station, Alstonville; the Agricultural Research Stations at Condobolin, Cowra, Grafton, Tamworth, Temora, Trangie and Wollongbar, the Viticultural Research Station, Griffith, the Horticultural Research Station, Narara, and its Somersby section, and at the Queensland Border; also desilting of tanks, construction of concrete storage tanks, and equipment erection on Public Watering Places in the Western Division of the State.

Extension Service.—Numerous enquiries from landholders about building problems were attended to by letter or personal interview, and plans representing buildings to the value of £370,660 were supplied to farmers.

Pastures Protection Section

PLAN FOR EXPANSION OF FIELD STAFF

Since October, 1963, the field staff of the Section has comprised one Field Officer (now designated Senior Field Officer) and one Assistant Field Officer. But a minimum of six men is needed.

A plan was submitted to the Public Service Board in May, 1964, for the Section's field staff establishment to be changed from one Field Officer, one Assistant Field Officer (Rabbits) and one Assistant Field Officer (Reserves)—to provide for one Senior Field Officer, four Field Officers and one Assistant Field Officer. In the proposed new establishment each of the four Field Officers would be concerned with the three main aspects of the field work (inspection and general review of travelling stock reserves; extension work on rabbit control, including training Rabbit Inspectors; and organising campaigns to control plague locusts); and each Officer would cover about one-quarter of the 48 Pastures Protection Districts within the Eastern and Central Divisions of the State.

It was envisaged that the Field Officer positions could be filled by men already employed by Pastures Protection Boards as Rangers. Many of these could carry out the Departmental duties with a minimum of further training.

In October, 1964, the Public Service Board approved variation in the establishment to provide for one Senior Field Officer, two Field Officers (and consideration to be given after six months to the creation of two more such positions) and one Assistant Field Officer. However, the salary range determined for the Field Officers has not drawn an application from any Pastures Protection Board Ranger. No person who did apply was considered suitable. The Public Service Board has now been asked to review the salary range for these positions.

RABBIT CONTROL

Training Schools and Field Days.—Schools Nos 17 and 18 were held, respectively in the Bega and Glen Innes districts, to train Pastures Protection Boards' field officers. A field day for directors of Pastures Protection Boards was held in association with each School, to demonstrate the methods of rabbit control and the latest equipment available.

More "1080" Used.—Sodium fluoroacetate ("1080") poison is now the most popular means of rabbit control. The quantity used has increased each year, as landholders have become more confident and skilled in its use.

Training Provisions, in Rabbit Inspectors' New Award.—A new Award covering Pastures Protection Boards' Rabbit Inspectors was made in April, 1965. It provided that inspectors with 12 months' service on the maximum of what previously had been a 3-year salary range, become eligible to take an examination for promotion to "Class Special". A further requirement is that before taking this examination, each Inspector shall attend a course of instruction arranged by the Department.

However, shortage of Pastures Protection Field Officers in the Department's establishment (see earlier parag aph, re plan for expansion) has made impracticable the launching of the series of courses for the 40 or more Rabbit Inspectors immediately eligible to attend.

PLAGUE LOCUST CONTROL

A small outbreak of plague locust occurred. Detail is provided in the Entomology Branch report. Well-organised ground spraying and limited aerial spraying controlled the swarms.

Two storage sheds for grasshopper insecticide have been erected, at Wagga Wagga and Forbes. These, with the earlier established depots at Dubbo and Gunnedah, should provide sufficient storage at convenient centres, for insecticide distribution enabling all Pastures Protection Boards to cope with outbreaks.

TRAVELLING STOCK RESERVES

At 30th June, 1965, 420 applications were in hand, awaiting inspection by field officers of the Section with a view to reports to the Minister as to whether particular reserves are still needed for travelling stock. The applications are from various persons seeking areas of travelling stock reserves which Pastures Protected Boards are unwilling to release from Board control. This is an increase of 72 over the number outstanding at 30th June, 1964.

The Senior Field Officer was able to inspect 50 areas this year. Many areas applied for have been waiting inspection for some years, due to shortage of Departmental field staff. The delays have led to a lot of non-progressive correspondence.

STAFF STATISTICS—PASTURES PROTECTION BOARDS

The number of veterinary inspectors employed by the 59 Pastures Protection Boards increased from 33 to 34; the total of Secretaries remained at 58 (reported, incorrectly, in the 1963-64 report as 59, but two Boards share the one Secretary); the Ranger total increased from 63 to 65; and the Rabbit Inspector total increased from 65 to 69.

Biometrical Branch

General.—This Branch continued to provide advice to investigators in other parts of the Department; on design of experiments, on analysis and interpretation of results, and on sampling and survey methods and related problems. At the start of investigations the biometrician helped to clarify and define objectives, select the precise questions to which answers were to be sought, and decide the exact plans and procedure. On completion of experimental work he was available for mathematical-statistical analysis of the data obtained and to advise on interpretation.

Advice was tendered this year on a wide variety of subjects, including: design of fertilizer and other experiments with field and fruit crops; animal nutrition experiments; sampling methods; selection of sites for experiments and size of placement of plots in the field. Results of experiments in numerous projects mentioned elsewhere in this Report were statistically analysed.

Consulting work on design of experiments, and computing work in analysis of results, increased. This reflected increases in research establishment throughout the Department.

Punch-Card Section.—Programming is continuing for the data-processing of dairy herd recordings, on the Public Service Board's computer. Eventually the Punch-Card Section will be responsible only for the punching and verifying of cards for input to the electronic computer. The computer will process the records and print all tables and summaries. At end of the year the Punch-Card Section was still responsible for the stages of data-processing up to production of completed lactation cards, including production of lactation statements for Official Recording units.

RESEARCH STATIONS BRANCH

Scope

The Research Stations Branch continued to

- supervise and administer *the provision of research* facilities at 19 stations;
- supervise *farm operations* at Hawkesbury and Wagga Agricultural Colleges and Glenfield Veterinary Research Station;
- supervise the purchase and maintenance of plant and machinery for Division of Plant Industry projects at Berry and Graman; the Royal Botanic Gardens and Centennial Park; and the Agricultural Research Institute, Wagga;
- advise Division of Science Services on machinery acquisitions;
- develop and supervise the Farm Mechanisation Advisory Service; and administer a limited, agricultural machinery research programme.

The responsibilities are expediently classified as "Developmental" and "Operational" for the purposes of this Report.

Developmental Aspects

RESEARCH STATIONS

Tropical Fruit Research Station, Alstonville.—Stage I of the irrigation works was commenced, including installation of pumps, rising main and reservoir. Additional areas were planted to tropical fruits for research.

Agricultural Research Stations, Bathurst and Orange.—Reorganisation of the Bathurst research programme required more equipment and staff. A large area at the Orange Station was cleared. Plant, equipment and facilities were increased. These developments allowed planting of additional potato research areas and will permit orchard research.

Tobacco Research Station, Ashford.—The area was cleared as a first step in development.

Agricultural Research Station, Condobolin.—Supply of a major plant unit was completed for expanded cereal nutritional and plant improvement work. This marks a major stage in expansion of central western research.

Horticultural Research Station, Dareton.—Extensions to the irrigation and water disposal facilities advanced this Station's development.

Agricultural Research Station, Glen Innes.—A big programme of subdivision fencing was completed. This is for a beef cattle research project—a major expansion of the Station's work.

Agricultural Research Station, Grafton.—Beef cattle "off station" research has expanded appreciably here. It required a major fencing subdivision programme.

Viticultural Research Station, Griffith.—More irrigation facilities were provided, to advance the re-development of research here.

Agricultural College and Research Station, Yanco.—Substantial capital works were completed or initiated, further to the needs of the Farm Certificate Course. The main works were another dormitory block (50 beds), a lecture/laboratory block, a wool-classing lecture room, a water supply filtration plant, and a septic system. Also, some of the existing structures were remodelled.

Also, equipment for an important phase of the Cotton Research Programme was supplied.

Other Research Stations.—Appropriate action within the means available were taken on all other Research Stations; by erection of new buildings, adding facilities, and modernising plant and machinery.

OPERATIONAL

Expenditures on maintenance, extension and renovation of buildings, fences, water supply, roads and other similar items at Research Stations amounted to £45,000. Also, much work of a minor nature was done by farm labour and is not taken into account in that expenditure total.

Buildings.—Extensive maintenance, alteration and improvement programmes were carried out at Alstonville, Grafton, Narara, Wollongbar, Dareton, Trangie and Yanco. This work is itemised in the Architect's Report.

Fencing.—Extensive sub-division and boundary fencing programmes were advanced. Expenditure on this was £6,500.

Roads.—Road maintenance work including shaling, gravelling and sealing proceeded as part of the normal operations. New roads are formed and sealed as land use extends. Extensive shaling was done on Stations in high rainfall areas, such as Wollongbar, Duck Creek Substation, Alstonville and Grafton. Tar sealing was done at Narrabri and Cowra.

Aesthetic Surrounds.—Maintenance of windbreaks, ornamental trees and shrubs, lawns and gardens was a feature of operational planning at all Stations. This year further tree planting and layout improvements were undertaken at Alstonville, Dareton, Griffith, Narrabri, Shannon Vale and Leeton.

Soil Fertility.—Maintenance of soil fertility at a high level was pursued by each Station Manager; through rotational planting and grazing, cover crops, fertilizers, appropriate stocking rates, drainage, and soil conservation.

Property Security.—Extremely dry to drought conditions provided constant fire threat. Advance preparations and vigilance reduced outbreaks to incidents of minor nature. The most serious incident involved about 200 acres of the Temora Agricultural Research Station.

Irrigation.—As well as at Dareton and Griffith (mentioned under "Developmental Aspects") irrigation lines and layout to include new areas were extended at Narrabri and Shannon Vale. Also, at Orange and Alstonville new installations are proceeding. Plans and specifications for irrigation installations at the Ashford Tobacco Research Station have been prepared by the Water Conservation and Irrigation Commission.

Fodder Production.—The production season was less favourable than the previous one for pasture and lucerne hay. But the 1964 cereal crops were phenomenal and greatly increased the fodder reserves at producing Stations.

Drought conditions prevailed on all non-irrigated Stations in 1965. Hand feeding commenced in February at Tamworth and in March at Glen Innes, Trangie, Condobolin, Temora and Cowra. Despite this, at the end of the 12 months the fodder stored on exporting Stations comprised about 1,876 tons of hay and 39,000 bushels of grain valued at £46,000. The hay reserves were comparable to those of a year earlier, and grain reserves had fallen only by 7,000 bushels.

Fodder in excess of local needs was transferred from producing Stations to others for utilization, or was held for future transfer. The transferred fodder comprised 20,489 bushels of wheat, 15,388 bushels of oats, 360 bushels of barley, and 185 tons of hay, and was valued at £26,780.

Seed Production.—Cereal seed was produced at a number of Stations to meet Station needs and for Foundation seed distribution to farmers. The season did not favour pasture seed production, but some was produced for research.

Narrabri Station produced enough cotton seed for its own needs, made some releases to the Namoi Seed Association, and also provided seed for seed increase at Glen Innes and Yanco Stations.

Stations engaged in fruit research produced sufficient seed, stocks, grafted trees or vines for their own needs; also vine cuttings for the industry. Narara Station produced 25,000 vine rootstocks for sale and essential distributions.

Livestock.—Drought conditions led to reduced stock numbers on some stations. Stock was transferred to other institutions where there were better fodder reserves or feed, or sold.

Farm Machinery.—Purchases of plant and machinery for Research Stations involved expenditure of £35,000 from the Consolidated Revenue Fund. Some items were bought with industry funds.

Advice was given to other Departments and instrumentalities on agricultural plant and machinery matters. Among these were the Departments of Public Works, Labour and Industry, Conservation, Public Health and Industrial Development and Decentralization; and instrumentalities such as the Development Bank and Rural Bank. The Food and Agriculture Organisation was assisted by provision of advice for the Indian Government on suitability and purchase of agricultural machinery. Assistance was given to Department of Labour and Industry in relation to operator protection, and to the Standards Association on horse-power rating of combustion engines.

Motor Vehicles.—The Chief, Research Stations Branch, is a member of the Department of Agriculture Motor Vehicles Committee. The Branch has the responsibility of recommendations for replacement of old vehicles, taking delivery of new ones on behalf of the Department and checking them on delivery. Research Station vehicles are but part of this work.

Stores and Minor Equipment.—Supply of stores and minor equipment to Research Stations was supervised by this Branch. Purchases of this sort, and costs of repairs to plant, involved expenditure of about £74,000.

Labour.—Supervision and selection of labour for Research Stations are responsibilities of the Branch and individual Station Managers. The personnel total increased by seventeen this year, mostly farm hands.

RESEARCH

The Branch did not appreciably engage in research, but did test agricultural machinery acquired with funds from the Commonwealth Agricultural Machinery Research Vote and Commonwealth Agricultural Extension Grant.

Assistance was given to the University of New South Wales and the Wheat Industry Council, in agricultural engineering research projects concerned with bulk handling, grain cracking problems in wheat and grain dryers.

The Agricultural Engineer is supervising a project for development of a rotary sod seeder designed to sow tropical legumes on the north coast in locations where existing machinery is unsuitable.

It is increasingly evident that applied investigational work on agricultural machinery and farm mechanisation is essential, to properly inform the Agricultural Machinery Officers in the Regions and increase the help given to rural industries. To this end, the Branch is seeking appointment of an agricultural engineer for full-time engagement in applied agricultural mechanisation research.

The Agricultural Engineer and Extension Services

Individual Contact, Mass and Group Media.—The Agricultural Engineer devoted much time to keeping the decentralised Agricultural Machinery Officers informed, including in-service training for recently appointed officers.

His own extension service activities included thirteen articles in the *Agricultural Gazette,* five Departmental booklets and twenty-four items for the press; seven radio talks taped for "syndicated" distributions, one television session, and four articles written for field-day programmes. He attended twelve machinery field days, and thirty-three meetings and agricultural conferences, and delivered five addresses at farmers' meetings. He adjudicated at the Junior Farmers State Championship for Tractor Maintenance and Operation, and for New Implement Awards at two machinery field days.

Safety in Agriculture.—The Agricultural Engineer served in the Advistory Committee for Safety in Rural Industries set up by the Minister of Labour and Industry, and in the inter-Departmental Committee on Occupational Health which is advisory to the Public Service Board. He attended the six-day school on Occupational Health and Safety conducted by the University of Sydney. The Commonwealth Department of Labour and National Service was helped by advice on two publications, "Tractor Safety" and "Electricity Safety". Thirty thousand copies of the "Tractor Safety" booklet were received. These were widely distributed following publicity by the Department's extension services.

Standardisation of Machines.—The Agricultural Engineer provided advice to the Standards Association of Australia on the standardisation of agricultural machinery.

Schools in Agricultural Engineering.—As a member of the lecturing panel the Agricultural Engineer, in association with the Agricultural Engineering Society, organised a residential school at the Hawkesbury Agricultural College for members of the Machinery Trade. The theme was "Markets, Machinery and Cost Influences in Agriculture". About 100 attended the school full or part-time.

Testing Agricultural Machinery.—The Agricultural Engineer served on two committees set up by the Australian Agricultural Council, respectively, "to investigate a proposal to establish an Australian testing station for agricultural machinery (other than tractors)" and " to inquire into the question of tractor testing in Australia".

The Regional Agricultural Machinery Officers

Location of these Field Advisers.—Demand for the services of the decentralised Agricultural Machinery Officers continued to increase. Another officer has been appointed. He is located in the North-western Region, at Gunnedah. Another position has been approved, to serve the North Coast Region.

Agricultural Machinery Officers are now located in the South-western Region (headquarters Leeton), the Western Region (headquarters Orange), the Southern Region (headquarters Wagga), and the North-western Region (headquarters Gunnedah).

These officers advise landholders in the use, servicing, maintenance and repair costs of agricultural machinery. They also advise on purchase and replacement of suitable farm plant, having regard for economic potential of the holding.

An Agricultural Machinery Officer is attached also to Yanco Agricultural College and Research Station. He lectures to students taking the Farm Certificate Course.

Diversity of the Advice Sought.—These officers visited 693 individual properties. The diversity of advice sought of them is shown by the following examples from individual visits:—tractor repairs, and selection; farm workshop layout; erection of shearing shed buildings, and layout of plant; hard surfacing of tillage implements; selection of rock pickers, and fodder conservation equipment; equipment for cattle yards and cattle crushes; selection and use of farm welders, and pumping equipment and land drainage; clover threshers; dairy hot water services; manufacture of grain bins; silos for temporary storage of grain; fodder rollers; grain drying silos; silage-making machinery; band-seeding machines; sod seeders; grass seed drying machinery; pumps and irrigation facilities.

Besides property visits, there were many office visits and mail enquiries by farmers.

Several requests were from growers' organisations, e.g.:—for information on ways of increasing the efficiency of rice headers; mechanical picking and handling of prunes; improving dehydrator equipment for drying fruit; bulk methods of handling fruit from the tree to the cannery or packing houses.

Dealer Liaison.—Frequent contact was made with local machinery dealers for two-way transmission of information. Over 100 visits for this purpose were recorded. One report notes a higher standard of service facilities in the Region concerned; specialised personnel having been recently located there by some machinery manufacturers to assist local dealers.

Group Extension.—The Riverina Machinery Field Day inaugurated in 1964 largely by the efforts of the South Western Region's agricultural machinery officer located at Leeton was held again in 1965. About 2,500 people attended. The programme included 47 exhibits and 164 working demonstrations. A Rice Header Field Day organised by this officer drew some 200 persons. Several smaller "days" dealing with orchard tillage equipment were held in this officer's area.

Ten machinery field days were attended by the Southern Region agricultural machinery officer, located at Wagga.

The officer located in the Western Region is a permanent member of the Orange National Field Days Organising Committee. His services contributed to the success of this major rural event, in November, 1964. Over the three days it was attended by about 45,000 people. The schedule comprised almost continuous comparative and working demonstrations with agricultural machinery and equipment.

The Agricultural Engineering Society (Riverina Branch) was formed at Leeton some 12 months ago largely through the efforts of the Regional agricultural machinery officer. The Society met monthly at Narrandera, Leeton and Griffith in rotation. Its membership of 44 provided a forum where landholders, machinery dealers, Departmental officers and CSIRO research workers met to hear guest speakers and discuss engineering problems.

The Regional agricultural machinery officers gave talks at meetings of Agricultural Bureau branches and other rural organisations, and at short-term schools for farmers.

Mass Media.—More than 200 tapes were received by the agricultural machinery officers and transmitted in radio programmes. The officers also participated in three television productions, and helped to provide visual aids for programmes by other Departmental officers.

Twenty special press releases and two items for the Agricultural Gazette were prepared by them.

Some Research.—Some investigation work was done by the Leeton officer, in association with manufacturers producing syphons for furrow irrigation. As a result the latest designed polythene syphons may become available at about half the cost of previously used aluminium syphons. Work is also proceeding on the use of rubber and plastic lines for portable spray heads in orchards. The Leeton officer also assisted landholders in the design—as well as purchase and installation—of portable spray irrigation.

The officer located at Orange helped the designing of a potato harvester which ultimately gained an Orange Field Day Award.

DIVISION OF PLANT INDUSTRY

General

EXTENSION SECTION

Agronomy Staff Engaged in Extension

Effect of Staff Shortage and Losses.—Shortage of suitably qualified agronomists experienced in extension continued to pose a major problem. Recurring loss of experienced men through resignations, retirements and secondments, has adversely affected the efficiency of service. There has been some satisfaction in knowing that the Division has equipped men with competencies which are still available to industry though lost to the Department.

Losses and Gains.—This year two District agronomists resigned, one to enter business on his own account and the other to join Australian Fertilizers Ltd. Also, five District agronomists were seconded or promoted to other duties or granted Study Leave. And one retirement occurred.

A new District was established on the north coast, with headquarters at Macksville. This increases the agronomist Districts to thirty-eight. Four are vacant, viz. Armidale, Glen Innes, Wentworth and Junee.

Six agronomists with intra-Departmental training for extension work were appointed to District positions. Staff change occurred in eight Districts.

Retirement of Assistant Principal.—Mr M. J. E. Squire, Assistant Principal Agronomist (Extension) retired. Mr F. Autry-Hall, formerly Murwillumbah District agronomist, was promoted to the position.

TRAINING FOR EXTENSION

Besides attendance of eight agronomists at the Department's two-week in-service training school on Extension Service/Methods, twelve agronomists received extension training through temporary basing at various Regional headquarters. Six of them have been appointed to Districts; one has Study Leave, one has been seconded to cloud-seeding, and four are continuing their training.

The plan designed to train officers in-service to qualify them for District agronomist responsibilities is working satisfactorily. The main lack is agronomists to undergo training —a predicament caused by too frequent staff losses. Continued loss of extension staff is due to more attractive conditions readily available to diplomates outside the Service.

EXTENSION ACTIVITIES

District agronomist work has each year become more complex and demanding. In part this is because of spectacular advances in agricultural science. In part it is because the modern farmer like most sections of the community has better education than was formerly so and is also aware, per press, radio and TV, of advances in agriculture. Being aware of these developments, he looks to the Department for more detailed information and advice on application of the developments to his circumstances. Departmental shortage of staff, changes of personnel, and the excessive number of farms in each agronomist's District, militate against effective personal service to more than a small minority of farmers.

Thus, farmers appreciating close contact are forming or joining Farm Advisory Clubs or submitting their problems to Agricultural Consultants in private practice. They pay for this service. Their aims are at keeping abreast of new technical advances and getting authoritative advice on farm records and economic farm planning.

Significantly, farmers who are members of Clubs or use an Agricultural Consultant, continue with few exceptions to take advantage of services provided by this Department. Similarly, the Clubs' Advisers and many of the private Consultants maintain close contact with the Department's field specialists and other services.

The Advisory Groups, and Management Consultants.—(See preceding paragraphs for background.) Twenty-three groups are known to be operating in New South Wales. Six are in northern, ten in western, and seven in southern districts. Known Farm Consultants total twenty; six in central western, and seven in southern districts; and seven in the Metropolitan area who provide advisory service to all parts of the State.

Significantly, in less favoured inland districts, and on the coast amongst dairy farmers, no corporate Group has been established. It would seem that in areas most in need of technical advice and farm planning the farmers are either not interested or have insufficient finance to form a Club.

Membership of a corporate Group is usually between thirty and forty; and annual cost of Group operation ranges from £4,000 to £5,000.

Statistics of District Agronomists' Extension Activities.—This year District agronomists participated in at least 207 field days, 201 meetings, 614 radio broadcasts and 24 television segments; and released 346 specific press articles.

Monthly, each District agronomist reported on and reviewed seasonal conditions and production trends. Though mainly for the Department this information continued to be available to and sought by the press; also financial, rural and other organisations, and individuals.

District Experiments, Trials, Demonstrations.—Each District agronomist, though primarily an adviser, conducted a range of experiments, trials and demonstrations in co-operation with farmers. These demonstrated recent development, new varieties, fertilizer applications, and other techniques. Field assistants helped with sowing of trials, and similar work, thus relieving the agronomist of some of the routine.

This year the District agronomists were responsible for 1,044 formal experiments/trials/demonstrations on private farms.

Supervision of Registered Seed Areas.—The District agronomists supervised, for reliable production of Registered seed, 105 wheat seed properties, 71 oat seed properties, 17 for barley seed, and 56 for rice.

Seed Certification Inspections.—In addition, District agronomists supervised and/or carried out field inspections of seed crops of grasses and clovers, potatoes, maize, sorghum and beans submitted by farmers for certification within the respective Seed Certification Scheme.

IN-SERVICE DEVELOPMENT OPPORTUNITIES FOR DISTRICT AGRONOMISTS

Advances demand that District agronomists shall keep abreast of trends. Advantage of opportunities available is taken; especially post-graduate courses; schools; conferences; and field days.

Former Kyogle and Armidale District agronomist Mr Noel Vane was granted a year's Study Leave for 1964, to engage in post-graduate studies for an Agricultural Extension Diploma at the University of Queensland. Acquitting himself with distinction he gained first place in the year. Shortly after resumption of duties he was lost to Division of Plant Industry by appointment as Regional Supervisor, Mid Coast and Hunter Region, Maitland. Lismore District agronomist Mr F. J. Hartridge is on Study Leave for 1965 to attend the extension diploma course at the University of Queensland.

Conferences attended by District agronomists this year comprised: the District Agronomists' Conference, residential, at Hawkesbury Agricultural College; the Plant Industry Regional Conferences at Bathurst, Condobolin, Tamworth; Regional Extension Conferences at Leeton, Gunnedah, Maitland, Orange; Wheat Improvement Conferences at Condobolin, Parkes, Wagga; Royal Agricultural Society regional meetings at various centres; Noxious Weeds Conferences at Coonamble, Maitland, Narrabri, Yanco; a Rice Industry Conference; and Agricultural Bureau State and Regional conventions.

Schools attended by various District agronomists this year included: the Extension Methods School, residential at Hawkesbury Agricultural College; a Bush Fire Control School, at Richmond; a Reading and Study Skills Improvement Course at North Sydney; Farm Economics, and Pasture Utilisation Schools, at Universtiy of New England and a Television School, at Gunnedah.

RESEARCH SECTION

AGRONOMY STAFF IN RESEARCH

Ten candidates were recruited and one resigned. Two plant breeders have been located at Canberra for an intensive training programme with the C.S.I.R.O.

PROVISIONS FOR NEW PROGRAMMES OF RESEARCH

Wheat Nutrition Research, Central West.—Wheat Industry funds were allocated for purchase of equipment for a mobile research unit to be located at Cowra Agricultural Research Station and to serve the eastern section of the Central West.

Pasture Research, Condobolin.—The agronomist appointed for this programme is initially confining his activities to the Condobolin Agricultural Research Station.

Pasture Research, Grafton.—Additional Beef Industry funds have permitted expansion of the Grafton Agricultural Research Station's regional pasture research programme, through appointment of two research agronomists.

Pasture Research, Trangie.—The agronomist appointed for this programme at Trangie Agricultural Research Station, co-operative with Division of Animal Industry, is receiving in-service training in pasture utilisation research methods.

Weeds Research, Tamworth.—The agronomist appointed to this programme at Tamworth Agricultural Research Station will work on weed problems of the north-west wheat belt.

Pasture Research, Deniliquin.—The agronomist concerned with this programme, of adapting research results from the CSIRO Riverina Laboratory, Deniliquin, will initially concentrate on productivity of irrigated pasture as affected by soil physical conditions.

PLANT INDUSTRY DIVISION'S REGIONAL CONFERENCES

Regional Conferences were held at Bathurst Agricultural Research Station, Condobolin Agricultural Research Station and Tamworth Agricultural Research Station.

Plant Introductions and Exchanges

Thirty-four plant introductions were made; and 220 samples of seed were sent to overseas research workers.

Land Settlement Services

District agronomists have an important role relative to selection of Estates under consideration for closer settlement. They participate in the preparation of topographical surveys, soil classification, and sub-division design. They advise on land suitability for various types of production and methods to be used. District agronomists this year participated in inspection of 15 Estates, comprising about 207,800 acres.

The Principal Agronomist (Extension) co-ordinates their services and carries out final inspection of Estates with Closer Settlement Advisory Board members. This year seven Estates comprising about 90,000 acres were so inspected.

Two Estates, comprising eleven blocks, were made available for ballot. Three other Estates were acquired. Design for these is not finalised.

Since inception of the present Closer Settlement plan, 178½ blocks have been set apart. Despite high land values, reflected high rentals, and the requirement that prospective settlers shall have substantial capital reserves before being eligible to be in a ballot, demand for blocks continues unsatisfied.

COLEAMBALLY IRRIGATION AREA

The Griffith District agronomist is the Department's liaison officer for Coleambally. He reports that a further 31 large-area farms were settled on Coleambally this year, increasing the total to 200 farms. Indicating the interest in land settlement and irrigation, there were 280 applicants for the 10 Coleambally blocks balloted early in June 1965. There will now be a lull in settlement there, until 1968, when another 70 blocks may be available—followed by 50 blocks more per year until the scheme is completed.

Planning and topographical inspections for the future subdivision are continuing, with Water Conservation and Irrigation Commission officers.

Irrigation

The drought after an almost unprecedented run of fair to good seasons has made farmers much more active on the need to ensure adequate water storage facilities for all purposes. Activity towards getting supplies from underground sources has notably increased.

Co-operation with W.C. & I.C.—This Department has no authority in water control and utilisation but assists the Water Conservation and Irrigation Commission in various ways.

This year the Commission was helped in the design of farms in the Coleambally Irrigation Area, and the Department's extension advice was widely used by the settlers.

The Department also helped the Commission to examine water supply matters in Benerembah and Tabbita Irrigation Districts, with a view to improvements. Similar help was given in the investigations of water supply for vegetable production in the M.I.A.

The Department is in two Committees established by the Commission; to re-examine likely irrigation development as a result of Burrendong Dam, and similarly to examine in relation to the Gwydir River.

Cases from the Farm Water Supplies Act, 1946.—The Department examined cases referred by the W.C. & I.C. These were in regard to increase or stabilisation of production from projects involving a Commission loan in excess of £1,000. At the start of the year eight were in hand. Ninety-eight more were received. All but eight of those were inspected, discussed with the landholder, and reported on. Because of the change in money value in future only the cases of £2,000 and over will be referred.

Increased Enquiries.—There has been an increased, constant stream of enquiries by landholders about spray and flood irrigation, crops and pastures to sow, construction or cleaning of dams, and methods to prevent dam seepage and evaporation losses.

Coupled with reduced flow of rivers and creeks, salinity has risen in many cases and has damaged pasture, lucerne, and fruit trees. Regional offices have had a big increase in samples for salinity analysis.

Many farmers have turned to night watering to reduce evaporation losses during spraying.

In almost all areas where water is from sub-surface sources the flow has been reduced. Many wells have had to be deepened, or pumping has been restricted.

Enquiries from overseas about irrigation potential of inland rivers have been notable, and mainly to do with the potential for cotton growing.

Drafting Sub-Committee on Spray Irrigation Standards.—The Department is represented in this sub-committee set up by the Australian Standards Association. A draft of the proposed code has been circulated. Comment on this has been received from many sources. The sub-committee is now preparing the proof issue.

Representations in Committees.—The Special Agronomist (Irrigation) represented the Department in a number of committees, as follows (with the originating body in parenthesis): —Hunter Valley Conservation Trust (Department of Conservation), sixteen meetings; Spray Irrigation Drafting Sub-Committee (Standards Association of Australia), seven meetings; Water Research Foundation, three meetings; Yanco College Farm Certificate Course Committee, three meetings; Burrendong Dam and Macquarie River Committee (Water Conservation and Irrigation Commission), one meeting; Agricultural Advisory Committee (Department of Technical Education), one meeting.

Participation by two officers of the Division of Plant Industry in an Irrigation Conference at Mareeba (Queensland) arranged by the Department of Primary Industries was appreciated by the Queensland Department.

Weeds

CO-OPERATION WITH OTHER ORGANISATIONS

Weeds Grant to Local Councils.—On a recommendation from Department of Agriculture, the increased grant of £115,000 was distributed by Department of Local Government to councils as follows: eight county councils, £44,050; ninety-three shire councils, £67,500; nine municipal councils, £3,450.

Co-ordinated Weed Control Efforts.—In recommending the grants and preparing programmes with councils, special efforts were made to achieve a co-ordinated control for the more dangerous noxious plants. The number was usually limited to about five in any one region. Most councils in the Riverina co-ordinated their efforts towards control of Noogoora burr (*Xanthium chinense*). On the central and southern tablelands most councils took firmer action to ensure serrated tussock control. One, the Upper Macquarie County Council, initiated a positive policy of entering and treating serrated tussock at the landholder's cost where the landholder has failed to meet his obligations. This, coupled with improved methods of treating infested non-arable lands, has resulted in more positive control being undertaken than has been seen before.

The Department participated in conferences of shires at Forbes, Deniliquin, Hay, Darlington Point, Coonamble and Sydney, to help co-ordinate noxious plant control.

Schools for Councils' Weeds Officers.—Two schools, each of two days, for Councils' weeds officers were held, at Tamworth and Goulburn.

Noxious Plants Advisory Committee.—Close liaison with Department of Local Government in administration of noxious plants legislation has been further developed, by establishment of the Noxious Plants Advisory Committee.

It was established in February, 1965. The members are: an officer respectively of the Department of Agriculture (Chairman), Department of Local Government, and Department of Lands; and two representatives of the Shires Association, including one who is a member of a "Weeds County Council".

The Committee is to furnish reports and recommendations to the Government on any matter relating to noxious plants, to review policy on noxious plants regularly and make relevant recommendations, to recommend to the Government annually the principles upon which grants should be made available to councils, to recommend any amendment of law relating to control of noxious plants, to carry out advisory and educational functions, to provide an avenue for Local Government and primary producers to contribute to noxious plant policy and its implementation, and to co-ordinate the activities and to improve liaison between landholders, councils, and the Government. Four meetings have been held.

Co-operation with Herbicide Firms.—The Weeds Section maintained liaison with herbicide manufacturers and importers, in research and development work. The weeds research officer appointed by Geigy Australasia Pty Ltd and located at Hawkesbury Agricultural College worked in co-operation with the Division. His work has been primarily a detailed evaluation of various triazine herbicides.

SERRATED TUSSOCK CONTROL AND RESEARCH

Control on Non-Arable Land by Aerial Treatments.—Aerial spraying of serrated tussock (*Nassella trichotoma*) has been highly successful. Complete kills of tussock were obtained with 25 lb of 2,2-DPA per acre, not burnt after spraying, and 7½ lb per acre if the tussock was burnt one month after spraying. Establishment and growth of improved species on the sprayed areas was good in 1964 but suffered during the dry summer of 1964-65.

Further landholder acceptance of aerial methods for control of serrated tussock was evident. A total of 2,515 acres of serrated tussock was sprayed in the summer of 1965, compared with 766 acres in 1964. Landholders sprayed 1,001 acres, the Forestry Commission sprayed 950 acres before planting pine trees, and 564 acres were sprayed in the Department's experiments.

Trials of the aerial spraying methods so successful on the central tablelands have been started on the southern tablelands, near Jerangle and Anembo.

Increased Use of 2,2-DPA.—Use of 2,2-DPA for spot and aerial spraying of serrated tussock on the central tablelands increased markedly. In the first three months of 1965, some 22,843 lb of 2,2-DPA was used, compared with 20,000 lb in the twelve months of 1964 and 7,145 lb in 1963. On the southern tablelands, the increase in the use of 2,2-DPA has reduced many severe serrated tussock infestations to sporadic patches.

Ant Thefts of Aerially Sown Pasture Seed.—Species of ant (*Pheidole* spp.) have been taking aerially sown pasture seed. One nest collected at a rate of about 200 seeds per hour. Seed taken was red, white and subterranean clovers, ryegrass, cocksfoot and phalaris. If ants could find all the seed sown they could, working at that rate, in 12 hours collect all the seed sown. The ants have been observed taking seed pelleted by the multi-step pelleting techniques.

By treating aerially sown pasture seed with dieldrin, clover establishment has been increased up to seven times and grass establishment up to twenty-seven times.

Chemical Ploughing, Fertilizers and Inoculation.—Removal of competition of the strong perennial (serrated tussock) by chemical means did not increase the establishment of clovers but greatly aided establishment of aerially sown grasses. Addition of 48 lb of nitrogen per acre decreased the establishment of clovers and had little effect on grass establishment. The nitrogen depressed nodulation of clover seedlings, from inoculated or uninoculated seed. There was little difference in establishment of inoculated or uninoculated seed.

Growth of clover plants from inoculated seed was much greater than growth from uninoculated seed. Nitrogen depressed clover growth but greatly increased grass and weed growth.

Red, white and subterranean clovers, ryegrass and cocksfoot established readily on unploughed ground. Establishment of *Phalaris tuberosa* varied from two to nine per cent.

Urea Molasses Blocks and Serrated Tussock.—Sheep forced to graze a serrated tussick-improved pasture association supplemented with urea and molasses blocks lost 33 lb liveweight in 101 days. Sheep on an unsupplemented tussock-pasture association lost 41.0 lb in the same period. The sheep preferentially grazed the improved pasture and only ate tussock when the pasture was non-existent.

INDIAN HEMP ERADICATION

An infestation of Indian Hemp (marihuana) was discovered in the Lower Hunter area during spring 1964. The Government directed the Department to eradicate the infestation. Departmental officers, contractors and casual employees were used to locate and treat infestations. Under the prevailing dry conditions amitrole proved to be the most satisfactory herbicide. Atrazine was added in most areas, to give residual control of seedlings. So far as is known, no plant set seed during the season.

WEEDS RESEARCH AT YANCO AGRICULTURAL RESEARCH STATION

Weed Control on Ditch Banks.—An experiment to investigate herbicides for this purpose yielded mixed results. Some herbicides (amitrole; picloram; 2,4-D) controlled broadleaf weeds (docks; Patterson's curse), and bromacil provided strong residual activity against these and grass seedlings. But no adequate control was found for established paspalum.

Effect of Picloram and Boxthorn.—African boxthorn was controlled with a spray containing 750 ppm to 1000 ppm a.i. picloram, provided the bush was thoroughly covered.

Weed Control in Linseed.—Yield results and field observations indicated that linseed is able to tolerate the following amounts of various herbicides: diallate 1 lb a.i./acre (at least); picloram 6 oz a.i./acre (but not 8 oz); MCPA 8 oz a.i./acre (at least); G34698 (Geigy) 2 lb a.i./acre pre- or post-emergence (but not 4 lb a.i./acre); G36393 2 lb a.i./acre (at least); TCA 8 lb/acre (at least); 2,2-DPA 2 lb a.i./acre (at least).

Chemicals for Bathurst Burr (Xanthium spinosum) *near Cotton.*—This experiment sought safe methods of burr control near cotton crops. Amitrole was the only non-growth regulator herbicide to show promise. At the rates which proved effective it should be economically feasible. Diquat and ametryne did not give satisfactory results under the dry conditions.

Weed Control in Rice.—Two experiments were carried out; a pre-emergence and a post-emergence trial. The most outstanding new herbicide was ordram (ethyl-1-hexamethyleneiminecarbothiolate). This equalled propanil for weed control, and gave a much greater range of time of application. Rates of 3 and 6 lb a.i./acre were applied pre-emergence, early post-emergence and after permanent water was applied. Each gave good control of barnyard grass without significant damage to the rice.

Weed Control in Cotton.—Outstanding in this trial was trifluralin. Alone at 1 lb a.i./acre, incorporated to a depth of three inches, it effectively controlled grasses. In combination with prometryne 1 lb. a.i./acre or linuron 2 lb a.i./acre it gave an almost weed-free crop. Also of interest, up to 2 lb a.i./acre prometryne or 4 lb a.i./acre linuron could be incorporated to three inches pre-sowing, without giving any crop injury.

WEEDS RESEARCH AT HAWKESBURY AGRICULTURAL COLLEGE

In Vegetables

In Carrots.—Of the herbicides tested, trifluralin at 6 lb. a.i./acre gave the highest crop yield. This application rate was not soil-incorporated. Further testing with soil-incorporation is warranted, to establish equally satisfactory results with lower rates.

Other herbicides which gave good crop yields included prometryne 0.75 lb a.i./acre; linuron 0.75 lb a.i./acre; chloroxuron 4 lb a.i./acre; propazine 0.5 lb a.i./acre; and linuron 0.6 lb a.i./acre. Of these, only linuron 0.6 lb a.i./acre was applied post-emergence.

Only DCPA 8 lb a.i./acre, and diphenamid 2 lb a.i./acre, each applied pre-emergence, gave lesser yields than the untreated control plots.

In Potatoes.—Best crop yields were obtained from simazine 1 lb a.i./acre plus prometryne 1 lb a.i./acre at emergence; diphenamid at 4 and 6 lb a.i./acre pre-emergence; and trifluralin 2 lb a.i./acre, not incorporated, pre-emergence.

In Pastures

In Summer Legumes.—The problem of extreme competition from weeds during establishment of tropical and sub-tropical pasture legumes has led to an examination of herbicides for use in this field. Results indicated that trifluralin may be highly suited to this work. Excellent crop tolerance was apparent in the range of species tested. It controlled broadleaved and grassy weeds. Prometryne showed some promise for broadleaf control, particularly over a range of species which were tolerant to trifluralin. These two herbicides might well be used to advantage in combination.

DROUGHT AND WEEDS ENCROACHMENT

Drought, especially in the north, has reduced weed infestations. But the opening of pastures by overgrazing will permit heavy infestations by weeds when rains fall. The wide distribution of introduced fodder will also help the spread of some weeds to new districts.

NEW WEED; COLOCYNTH

Colocynth (*Citrullus colocynthis* (*L*) *Schrad*), a wild perennial melon, has been found growing in a number of northern parts of the Western Division, on disturbed soils of light texture. It is regarded seriously in South Australia, but not so in Queensland.

WEED SURVEYS

Khaki Weed.—District agronomists co-operated in a survey to determine present spread and importance of khaki weed. Conclusions were that the weed was widespread in coastal, slopes and plains regions but an economic pest only in lucerne areas of the Lachlan Valley.

Wild Oat Species.—In a survey of the principal wild oat species, grain samples taken all over the State from wheat silos in 1958 and 1963 were examined. This showed that *Avena fatua* is more widespread in southern and *Avena ludoviciana* more serious in northern areas. In the interim the proportion of *Avena ludoviciana* to *Avena fatua* has increased in the north.

REVISION OF WEEDS BOOK

Revision of the Weeds book has been a major project this year. The herbicides section had to be re-written. The re-write is practically complete.

Pastures Section

GENERAL

Responsibilities

Pastures Section responsibilities include pasture research and extension, organisation of pasture seed production and certification, administration of the Seed Testing Laboratory, and inspections under various Acts including the Agricultural Seeds Act of 1921, and the (in part) Stock Foods and Medicines Act of 1940.

Highlights

Highlights this year included the continued interest in pasture improvement, despite the impact of drought in the second half of the year; record production of pasture seeds, stimulus to research by Industry funds; increased interest in stocking rate and pasture utilization systems; and the progress in whole-farm feed-year research and extension on the north coast.

Increasing Sown Pasture Acreage

The estimated improved pasture sown area as at 31st March, 1964, was 10,625,000 acres, compared with 10,178,000 in 1963 and 9,994,000 in 1962; about 630,000 acres increase over the two years. But, allowing for pasture acreage ploughed up for wheat growing, the area actually sown to new pastures in 1963-64 was near to 1,000,000 acres.

Seasonal Conditions

Above average conditions were experienced by most of the State for the first half of 1964. Most districts came into the summer of 1964 with a good build up of reserve pasture. Then the change occurred. From November the drought conditions gradually deepened in all areas but with less effect in the south west and the Riverina.

In the Northern Region, the driest conditions on record were experienced in the first six months of 1965; in the Mid-Western Region, conditions were driest for 80 to 90 years. In the North Western Region, recorded rainfall was the lowest since 1902.

Industry Funds Effect

Further funds from Cattle and Beef, Wool, Dairy, and other Industry Research Committees increased the number of pasture research projects. This applies particularly to grazing trials at Wollongbar, Grafton, Glen Innes, Shannon Vale, Wagga, Trangie, Leeton, Yanco, Condobolin, Temora and Tamworth. The increased scope and volume of work made possible by these Funds caused staff stress but have led to approvals for additional research agronomist appointments.

Post-Graduate Studies

Research agronomists have been encouraged to register with Universities for masterate and other higher degree studies involving subject matter in keeping with their Departmental projects. Three pasture research agronomists are currently doing Ph.D. research projects (two overseas and one in New South Wales) and eight have registered with Australian universities for M.Sc. research.

Appointments for Adaptive Research

Last year's appointment of an adaptive, pasture research agronomist for the southern tablelands, has strengthened the research-extension team. So, too, has the appointment of an adaptive pasture research agronomist at Deniliquin. He will work in co-operation with the CSIRO Riverina Laboratories.

Co-operation by the CSIRO in supplying these adaptive research agronomists with facilities, equipment, office space, and personal contact with a large number of experienced research workers, has great value in staff training, research and extension.

Trials by the officer stationed with the CSIRO at Canberra have emphasised the value of sudax as a summer forage, demonstrated the possibility of sod-seeding perennial grasses and lucerne, and highlighted the value of correct inoculation and seed pelleting procedures in pasture legume establishment on problem, acid soils.

At Deniliquin, earlier studies in close liaison with the CSIRO Pastoral Research Laboratory related to the application of research on gypsum applied in irrigation water for promotion of pasture establishment on heavy soils in the south west. The research liaison now is primarily concerned with pasture irrigation frequency and related soil physical problems.

Other Co-operative Projects With CSIRO

Projects involving co-operation and joint publication with CSIRO personnel have been commenced also at Narrabri and Condobolin.

Research Activities of District Agronomists

From pre-packaged trials (U.P.S.E.T.) surveying the occurrence of soil deficiencies and the adaptability of new pasture species, a body of research data is being collated. This is being prepared for publication, and currently used in district extension work.

Delegation to Ninth International Grassland Congress

The Assistant Principal Agronomist (Pastures), Mr W. T. Atkinson, was a Departmental delegate and presented a co-authored paper ("The phosphorus and sulphur needs of pastures in New South Wales") to the Ninth International Grassland Congress held in Brazil from 7th to 20th January, 1965.

A research agronomist from Wollongbar Station, Mr R. L. Colman, also attended as a Departmental delegate and presented a co-authored paper ("Development and evaluation of pasture for dairy cattle in a sub-tropical environment") on behalf of the Wollongbar research team. He also visited pasture research centres in Africa, South America, West Indies, U.S.A. and Fiji.

Plant Explorations Overseas

Whilst travelling to and from the Ninth International Grassland Congress in Brazil the Assistant Principal Agronomist (Pastures) visited research and extension officers in Mexico, Central America and some South American countries. He returned through southern, sub-tropical States of U.S.A. and sighted range management research in south western U.S.A.

This itinerary provided collection of more than a thousand samples of native pasture plant material. These samples reflect the concept of "high altitude—low latitude" plants for Australian conditions. This material could have "short day" adaptability, frost tolerance and good, winter-growth potential.

The material, seed and vegetative stocks, was received in the first instance by the United States Department of Agriculture at Beltsville, then the CSIRO Plant Introduction Centre, Canberra, then the N.S.W. Department of Agriculture. Thus, through three-way co-operation, material from Mexico and Latin America has been shared between the three.

PASTURE RESEARCH

Forage Species Improvement

The current trend draws no hard line between pasture species and forage crops. A wide range of feed resources is needed for a flexible and reliable "feed-year".

Highlights in species improvement are reported with reference to particular districts and new and promising forage species strains.

Sub-Tropical Legume (*Desmodium*), North Coast

Despite the drought year the areas sown to sub-tropical pasture species on the upper north coast increased from 1,500 to 8,000 acres. The dry conditions prevented a more spectacular increase, but also demonstrated the drought-hardiness of these sub-tropical pasture plants.

Farmer Acceptance.—Despite the adverse 1965 season the area sown to sub-tropical pasture species in the Taree, Grafton, Murwillumbah, Kyogle, Lismore and Macksville districts increased from a modest 1,500 acres in 1963-64 to 8,000 acres in 1964-65. In the Tweed and Byron Shires the total increased from 550 to 3,550 acres. In the Kyogle and Lismore districts, where the sowings of sub-tropical pasture species were limited in 1963-64 to small demonstration areas, sowings this year totalled 2,300 acres. In these sowings were Silverleaf Desmodium 640 acres, Greenleaf Desmodium 94 acres, Glycine 1,250 acres, Sirato 304 acres, Dolichos lab lab 600 acres and Lotononis 5 acres.

The adverse season did restrict sowings, but also demonstrated the drought hardiness of these sub-tropical pasture species. This was commented on in the annual reports of all District agronomists concerned.

Strain Accessions and Seed Increases at Grafton Station.—300 new accessions were under observation in 1964-65. Of special promise in nursery stages are strains of *Eragrostis curvula, Cynodon dactylon, Lotus corniculatus, Chloris guyana, Setaria italica, Setaria sphaceleta, Stylosanthes gracilis, Glycine javanica* and *Phaseolus atropurpureus.*

Seed has been increased of strains of *Leucaena glauca, Aeschynomene falcata, Paspalum notatum, Desmodium intortum* and *Panicum maximum* var "Coloniao". These species have been screened on a number of soil types in the Upper Clarence Valley, and in sward trials under grazing at some centres.

Other promising sub-tropical species include *Digitaria decumbens, Desmodium uncinatum, Lotononis bainesii, Setaria sphacelata, Brachiaria brizantha, Trifolium repens* (Ladino), *Phalaris* hybrid (Ronpha grass), and *Panicum coloratum.*

Frost tolerance and spring growth are being tested in a number of Rhodes grasses, and *Paspalum malacophyllum, Hyparrhenia* spp., *Setaria sphacelata* (Kazungula and Nandi), *Panicum coloratum* var *Kabulabula, Panicum maximum* var *Trichoglume, Paspalum regnellii* and *Paspalum notatum.*

Large scale grazing trials have been established with *Siratro, Glycine javanica, Leucaena glauca* and *Lotononis bainesii.* These are providing valuable grazing experience of these subtropicals and indicating their economic potential in a "feed-year" system. Trials in the Clarence Valley promise new inclusions for "free range" and "special purpose" use in the beef "feed-year".

Hunter Valley, Species Trials.—The value of Ladino clover, Kangaroo Valley ryegrass, *Phalaris tuberosa,* Currie cocksfoot, and vetches have been demonstrated.

Irrigation Pastures for Namoi Districts.—Phalaris-lucerne and Clare subterranean clover-Wimmera ryegrass have proved the most suitable pasture mixtures under irrigation in these areas.

Species Introductions at Temora.—The promising ones include "Moapa" lucerne, P.3740 lucerne from Spain (it has a winter-growing summer dormant growth cycle). *Phalaris tuberosa* strains from the Mediterranean, *Eragrostis curvula, Bromus catharticus, Dactylis glomerata* (strains from Morocco and Algeria), *Trifolium clypeatum,* and *Trifolium spumosum.*

Strain trails continued with summer grasses, cocksfoots, Phalaris, fescues, lucerne, subterranean clovers and medica. Marrar and Howard appeared the most suitable varieties of subterranean clover at Temora. Snail medic and Cyprus Barrel medic were superior at Moombooldool. Merridea Wimmera rye grass also did well in Temora trials.

Grazing Performances at Yanco.—Trial areas were established to test the grazing performance of five subterranean clovers, Rose clover, Barrel medic, Hunter River and African lucerne, *Stipahyalina, Phalaris tuberosa,* two cocksfoots, perennial veldt grass and Sheep's Burnet. The five latter were sown with Marrar subterranean clover. *Stipa hyalina* showed poor summer survival, but Sheep's Burnet, Moroccan Cocksfoot and African lucerne appeared to establish, persist and produce well.

Securing Improvements for Western Marginal Areas.—At Condobolin, current investigations aim to secure improved annual medica, lucernes and perennial grass species for this marginal farming environment; to supplement natural pastures in meeting needs at profitable stocking rates. Some promising annual legumes are also being evaluated in a grazing trial at Condobolin.

Lucerne Variety Trials at Tamworth.—Hairy Peruvian has shown a 9 per cent yield advantage over Commercial Hunter River. New South Wales ecotypes of Hunter River lucerne have not differed significantly from Hunter River. African lucerne has also yielded well, at Tamworth and on granitic tableland soils.

Dryland, Lucerne Variety Trial at Narrabri.—Six varieties have been compared. Canberra creeping lucerne has equalled Hunter River and Hairy Peruvian for total dry matter production.

Under irrigation, Canberra creeping has not produced as well as Hairy Peruvian, African and Hunter River.

A co-operative re-selection nursery of creeping-rooted lucernes has been undertaken at Narrabri; jointly with the CSIRO, to select creeping lucerne material with better production in northern areas and with good seed production.

Pasture Legumes for Yass Valley.—Marrar, Bacchus marsh and Mt Barker subterranean clover were the most consistently promising pasture legumes in 1964 trials in the Yass Valley.

Cocksfoot Trials.—At Cowra a Moroccan strain of cocksfoot continues to show outstanding survival. Cocksfoots of Mediterranean winter-growing summer dormant type from Algeria and Greece are also promising. They have survived the 1964-65 drought.

A seed increase area (120 lb) of "Glen" cocksfoot at Glen Innes Agricultural Research Station will enable further regional trials of this locally selected cultivar.

Under the ruling dry conditions, damage by pasture scarab grubs has become increasingly apparent in cocksfoot-based pastures.

Fescues.—Interest in fescues is increasing, notably in Demeter, especially in view of a seasonal growth curve resembling cocksfoot. This trend is of special significance because of cocksfoots' high susceptibility to pasture scarab damage.

Phalaris, Comparative Trial at Narrabri.—CSIRO-bred, seed-retentive *Phalaris tuberosa* (P.6088) is being compared with commercial *Phalaris tuberosa.*

Grasses for South Coast.—At Berry on the south coast the drought has highlighted the great value of Kikuyu grass for summer and autumn bulk or roughage. Species trials (U.P.S.E.T.) have accented Rhodes grass and *Setaria sphacelata* and *Sorghum almum* as most productive summer growers at Berry.

The Kangaroo Valley perennial ryegrass seed harvest this year reached 10,000 bushels of cleaned seed. This cultivar continues to do well in coastal districts and also where heat tolerance and drought resistance are needs.

Drought Qualities of Eragrostis curvula.—Productivity and persistence of *Eragrostis curvula* has been noteworthy during the drought. At Glen Innes, Shannon Vale and Inverell this grass has shown up well under intense grazing. But in view of its heavy seed production, ready establishment and reserve palatability, this grass is a potential weed in good seasons and at conservative stocking rates.

WINTER AND SUMMER FORAGE CROPS

Winter and summer growing forage crop annuals have an essential role; supplementing seasonal pasture production gaps.

Winter Forage Crop Research.—At Leeton, grazing oats and cruciferous forage crops (rape and kale) have given best results for winter feed. Dry-matter yields were three times that of the standard, Wimmera rye-subterranean clover winter pasture.

In trials under irrigation at Leeton, forage crops grown on a prepared seedbed have yielded more dry matter than have sod-sown crops, but relative costs per acre have to be taken into account.

In the Grafton area, forage crops including oats, vetch, forage sorghums, cowpeas, and fodder cane have been tested for inclusion in stock feeding programmes.

Summer Forage Crops Research.—Sudax and hybrid forage sorghums are doing well in Leeton trials, as are Sudan grass SS6, Japanese millet and *Sorghum almum.* Summer forage crops appear to be an alternative to permanent summer pastures. The economics of each system will be studied in "feed-year" grazing experiments at Leeton.

Zulu, Sudax, Calala and Nemingha were best of the hybrid forage sorghums in trials at Narrabri this season. In seventeen weeks from sowing they produced 30,000 lb of dry matter/acre; compared with 18,000 lb from Tracy and Sugardrip—standard Sweet sorghum varieties.

At Narrabri, *Dolichos lab lab* out-produced Malabar and Havana cowpeas. It is an outstanding summer legume forage species.

LEGUME INOCULATION

Research at Tamworth included rhizobium strain and nutritional studies on lucerne and pasture legumes.

For a "problem" soil in the Trungley Hall (Temora) district, satisfactory subterranean clover nodulation was obtained by use of superphosphate and zinc coupled with pre-inoculation lime-pelleting.

Relative merits of simple and multiple-stage seed pelleting have been tested. For aerial establishment of pasture legumes, and on acid "problem" soils, the CSIRO's "3-stage" pelleting process has given good results. For less-acid soil, simpler "home-made" pelleting has been adequate.

PASTURE ESTABLISHMENT RESEARCH

In the Yass Valley, herbicide use on native species before aerial sowing of cocksfoot and Demeter fescue has given better surface-seeding establishment than has seeding into standing native pasture. In the same district, phalaris and cocksfoot were established successfully by sod-seeding into sparse native pasture on elevated sedimentary soils.

At Deniliquin co-operative work with the CSIRO has shown the value of dissolved gypsum in alleviating the problems of difficult, seedling emergence and lack of infiltration of water into some "grey and brown soils of the treeless plains" in southern irrigation districts. Feasibility of broadcasting gypsum to facilitate pasture establishment and pasture growth on these heavy soil types has also been indicated.

Remarkable increase in aerial sowing of pastures during the past few years and the proved value of "lime pelleting" of the seed to ensure effective legume nodulation has stimulated investigations into more effective pelleting processes.

Rapid progress in aerial pasture improvement has also emphasised the problem of aerially introducing perennial grasses (as well as pasture legumes) into natural pastures. In the course of serrated tussock research on the central tablelands, the work has shown that legumes can be established in native pastures with little or no reduction of grass cover; but perennial grasses in establishment stages have proved to be more sensitive to competition from existing native grasses, weeds or other plants.

PASTURE PLANT NUTRITION RESEARCH

The main soil deficiencies in New South Wales are nitrogen, phosphorus, sulphur, potash, molybdenum, zinc, copper and boron. Rapid increase in superphosphate usage on pastures, and increasing use of sulphur-fortified superphosphates and other more concentrated forms of phosphates-supplying fertilizers, has necessitated more precise studies of quantitative phosphorus and sulphur needs in various regions.

Hunter Valley Research.—This has diagnosed widespread soil deficiency of phosphorus, nitrogen and molybdenum in the area. In initial establishment of pastures, 4 cwt superphosphate/acre has been found to be desirable—with 2 cwt/acre satisfactory in later years.

Clarence Valley Research.—Pot and field trials with various levels of phosphate have aimed at developing a diagnostic test whereon to base phosphate recommendations. Soil phosphate analyses have revealed extremely low phosphate status over all geological formations in the area.

Shannon Vale Trials.—In a grazing trial, paddocks receiving ½ cwt or nil superphosphate/acre have noticeably declined in pasture production, compared with paddocks receiving 1½ or 3 cwt/acre.

Yanco Research.—Trials investigated the effect of time of fallowing, soil nitrogen x phosphorus levels, and seeding rate, on "haying off" of wheat crops grown on old pasture land.

Nitrogen Importance.—Nitrogen fertilizers have been used with good results on Kikuyu pastures at Berry, and in the Hunter River and far north coast regions.

High oat seeding rates in combination with high nitrogen applications have been used with good results in feed-year programmes in irrigation areas, and in tableland and costal districts.

Results suggest an important place for nitrogen fertilizers in planned, seasonal pasture and forage crop production.

Potash Survey Trials.—These were commenced this year, to identify and map potash deficiency occurrence in New South Wales pastures.

Pasture Management and Utilization Research

This is seeking more precise information on pasture reactions to various utilizations.

At Tamworth.—Total yield of lucerne was increased by allowing greater maturity of each cut, with reduced cutting frequency and also by close cutting—leaving a minimum of stubble. In a sheep grazing trial, yields were greater by allowing a tall regrowth before grazing.

At Trangie.—A lucerne grazing trial was commenced, for information on lucerne stand reactions to a stocking rate of four sheep/acre—managed on a ten-paddock system.

At Leeton.—Pasture management studies are noting the effect of sheep treading on irrigated, annual subterranean clover-Wimmera ryegrass pastures in the first week of regeneration. These studies have been extended to measure the effects of various stocking rates, and of access delays after the first irrigation, on winter annual pastures.

At Shannon Vale Nutrition Station.—Excellent wool production figures were obtained in all trials at the 1963-64 shearing in September, 1964. But the severe drought from November, 1964, has severely restricted wool growth at the higher stocking rates. Wool production average/acre for the Station reached 48.8 lb/acre, and wool yield average was 109.0 lb wool/acre from wethers run at 10/acre in a high stocking rate experiment.

Hand-feeding was needed to maintain the 12, 10 and 8 sheep/acre groups. But it was apparent that sheep at 4/acre would survive the winter without grain feeding—a tribute to the carrying capacity of well-established, sown perennial grasses.

In a comparison of set-stocking with strategic grazing at 4, 8 and 12 wethers/acre, the set-stocked sheep gained weight faster than the strategically grazed flocks under good seasonal conditions. But with onset of drought the set-stocked sheep had to be fed first, and weight losses in this group have been most severe.

The extension value of the work at Shannon Vale Nutrition Station has been a highlight of this year. There has been great interest by all visitors, especially from overseas and interstate.

At Glen Innes.—Pasture sowings, fencing and watering were completed for the full, beef cattle production experiment. This will compare "pasture only", "pasture plus hay", and "pasture plus hay plus forage crop" feed-year systems. An early result indicated the ability of well-established, paddock-saved, phalaris-based pastures to carry in-calf cows at one/acre from June to late October (1964) whilst maintaining weight-rising condition.

Under Southern Irrigation Conditions.—Leeton investigations have shown that five ewes and lambs/acre may be supported on Wimmera rye-subterranean clover pasture using an autumn lambing set-stocked management system. Experience suggests that higher than five breeding ewes/acre would require a different management system, coupled with winter forages, and with summer forages to fill gaps in summer and early autumn feed.

In Yanco's "improved" dryland pasture versus "unimproved" native pasture grazing trial, wethers stocked at two/acre on the "improved" dryland pasture did well. They maintained weight (up to 140 lb) throughout the season without hand feeding. The "unimproved" pasture sheep (maintained up to 104 lb) lost weight faster and drought feeding had to be adopted by early April, 1964.

At Cowra.—A grazing trial compared continuous stocking rates at 1, 2, 3 and 4 breeding ewes per acre on a Wimmera rye-subterranean clover-lucerne pasture. Lucerne has disappeared at continuous stocking rates of 2, 3 and 4 ewes per acre, and barley grass has built up inversely with stocking rate. Severe seed problems occurred in lambs at the lower stocking levels.

At Condobolin.—Grazing trials are measuring seasonal and annual wool production from natural pastures at three rates of stocking, and measuring the effects of these grazing pressures on perennial species. A parallel grazing trial aims at measuring seasonal and annual wool production from a Barrel medic 173 pasture, and to determine the effects of three levels of grazing on pasture persistence and composition.

At Hawkesbury Agricultural College.—Emphasis has been on development and utilization of improved, irrigation pastures for prime lamb production and on evaluation of individual pasture species in terms of lamb growth. Last year the work was concerned with evaluation of pure swards of subterranean clover, short rotation rye grass and oats as feed for prime lambs. Current work is concerned with a similar study of lamb growth on *Phalaris tuberosa,* white clover and Japanese millet. Pasture moisture content is being closely examined in relation to species evaluation and lamb growth performance.

Feed-Year Research

Far North Coast Pattern.—The feed-year research and extension pattern on the far north coast includes problem definition, research on technical problems, grazing trial and whole-farm assessment study of problems in the way of application of research findings, and economic appraisal of new farming systems. This approach has developed well. It offers a pattern for research and extension in other New South Wales environments.

Research Activity at Wollongbar Station.—This has centred on development of farming systems to provide year-round continuity of high quality feed for dairy cattle.

Important research findings at Wollongbar related to new, establishment fertilizers and lime-pelleting techniques for tropical and temperate legumes; tropical legume performance on various soil types; nitrogen use on Kikuyu grass for autumn and spring grass; oats-nitrogen as a winter forage feed-year addition; tropical grass and legume compatibilities; and methods for establishment of temperate species into subtropical legume-grass pastures.

North Coast Whole-farm Studies.—A Wollongbar team comprising agronomists, animal nutritionists and economists have combined to integrate results from their individual research programmes into new farming systems. The systems are being studied under whole-farm conditions, at Wollongbar and on commercial properties providing a range of north coast conditions. Progress results indicate from 18 per cent to 40 per cent production increases in the second lactation on feed-year pastures, compared with the pre-development production average of the respective farm.

At Grafton, substantial funds assistance from the Cattle and Beef Research Committee is enabling development of a team to conduct a balanced research programme on feed-year problems for beef production in the Clarence Valley. A Pasture and Forage Planning Committee further planned research on plant introduction, species and nutrition—and gave consideration to grazing trials, feed-year projects, and economics research for the Upper Clarence cattle country. A research programme for the lower alluvial river lands has also been considered. This has become very necessary in light of flood mitigation and drainage works in the Lower Clarence Valley.

At Taree, District research is aimed at provision of quality feed for dairy cattle at all times of the year. Trials have involved sub-tropical legumes, summer grasses, winter species, plant nutrition, nodulation of legumes, lucerne investigations, pest and disease studies, and planned pasture production on a whole-farm basis. The Taree work compares with the broad pattern of feed-year research on the far north coast.

At Temora.—Pasture species investigations for the 20" rainfall, mixed farming zone has been the main pasture research theme for several years. Increasing emphasis has been given to establishment, utilization and management of perennial species. There are now trials examining breeding ewe stocking rates on Wimmera rye-subterranean clover pasture phase, and evaluating the role of oats for grazing and grain in the Temora "livestock production year".

At Leeton.—Recent pasture research is determining the seasonal production of various pasture species and mixtures under irrigation; annual and perennial legumes and grasses, winter and summer pasture species, and winter and summer forage crops. These studies aim to determine the best possible feed-year system for large-area irrigation farms in the M.I.A., and future investigations will compare for particular livestock enterprises the economics of various feed-year management systems.

PASTURE EXTENSION SERVICE ACTIVITIES, AND DISTRICT TRIALS

District agronomists conducted 592 pasture trials and demonstrations on farmers' properties in 1964-65; including 507 trials under "U.P.S.E.T.". Besides, 77 pasture projects were established with Dairy Industry Extension Grant funds and eight with Agricultural Extension Grant funds.

The trials and demonstrations provided information on species suitability and fertilizer requirements on various soil types, but were also very useful extension aids and basic to numerous field days. District agronomists' capacity for increased experiment and demonstration work to provide the local information needed by farmers, is in part the outcome of field assistant appointments made possible by Extension Grant funds. Pre-packaged materials for the "U.P.S.E.T." series also has greatly reduced the time and work of trials' establishment.

A grant from the Sulphur Institute has assisted the compilation of fertilizer trial results for publication.

PASTURE SEED PRODUCTION AND CERTIFICATION

Increased Interest.—During 1964-65 interest in pasture seed production as a specialised, farm activity notably increased. This was especially apparent with tropical legumes and new varieties of perennial grasses. Also, for the first time, extensive areas of perennial grasses for seed have been sown in rows for inter-row cultivation and considerable nitrogenous fertilizer has been used.

N.S.W. Seed Growers' Association Formed.—It was formed this year, to promote interest in specialised seed production and to give seed growers united voice. The Seed Growers' Association has been given representation in the Herbage Plant Liaison Committee. Thus, growers are directly associated with release of new varieties.

Seed Increase Committee Formed.—This committee, representative of the N.S.W. Seed Growers' Association and the N.S.W. Seed Merchants' Association, has been set up to act as a sub-committee of the Herbage Plant Liaison Committee.

Higher Intra-departmental Staff Status.—Seed industry status was further recognised by the Department of Agriculture, in that the status of the Agronomist (Seed Production) was elevated to that of *Special* Agronomist (Seed Production), and an additional inspector was appointed.

Record Certified Sub. Clover Seed Production.—Production of certified subterranean clover seed was a record; 2,377 tons. The increase of 92 per cent in certified Marrar reflected the growing popularity of that variety. At 409.5 tons it was exceeded only by Mt. Barker (1,297 tons) and Dwalganup (467 tons).

Dwalganup showed a marked reduction, from 747 tons in 1963-64 to 467 tons this year.

INSPECTIONS, UNDER VARIOUS ACTS

Appointment of a third inspector permitted greater attention to routine inspections and special investigations concerning products sold under provisions of the Agricultural Seeds Act, Stock Foods and Medicines Act, Pest Destroyers Act, Fertilizers Act and Veterinary Surgeons Act. In the course of these duties 105 towns or suburbs and 520 stores were visited, and forty-nine samples were taken for testing.

SEED TESTING LABORATORY

Statistics.—Work volume in the Seed Testing Laboratory increased about 30 per cent over the 1963-64 season. Of the 3,382 samples received, about 900 were examined under quarantine regulations and 1,300 were for Certification tests.

Tests were done for seed firms, farmers, members of the public, the police, customs and railways Departments.

International Seed Testing Course and Workshop.—This was for South and South-East Asia. It was in New Zealand. The seeds officer attended.

The 1965 Australian Seed Testing Conference.—The seeds officer and another also attended this. As a result, new methods and equipment have been introduced into the Department's Seed Testing Laboratory. Also, agreement was reached in principle on establishment of common agricultural seed standards throughout the Commonwealth.

Germination Evaluation Scheme for Cotton.—This was introduced to aid selection of highest quality cotton seed for planting.

New Recording System for Maize and Sorghum.—This was initiated to relate each bag of Certified seed to a specific laboratory test. This in turn will provide information on the effect of storage on germination of carry-over seed.

New Laboratory Plans.—The seeds officer after visiting the Seed Testing Laboratory in New Zealand and the recently erected Victorian Seed Testing Laboratories, prepared plans for a much improved New South Wales laboratory.

Asian Visitors.—Agricultural scientists from Indonesia, the Philippines, Korea, Tai Wan (Formosa), Papua-New Guinea, Laos and Zambia visited the Seed Testing Laboratory.

Cereals Work

WHEAT

The Season.—Conditions for sowing were almost ideal—sufficient soil moisture and fine breaks for good soil preparation, sowing and germination. In the growing period rain was well distributed, except in August when a dry spell and heavy frosts set crops back especially on western marginal areas. General heavy rains in September and October helped recovery from frost injury, and good grain-filling. Further rain in early November interfered with the early harvest in the north-west and caused some deterioration in yield and quality of early crops. The subsequent weather was fine and dry and ideal for harvesting.

Acreage and Production Records.—Acreage sown, total production, and yield per acre in 1964-65 was each a record. They were the outcome not only of very good seasonal conditions but of continuing research, which has improved varieties and practices, and of extension services which have passed research results on to the farmer.

In New South Wales, 151,483,000 bushels of wheat were harvested from 5,760,000 acres sown for grain; a per acre yield average of 26.3 bushels. This was 1.6 bushels per acre better than the previous record production, 1963-64, and 7.4 bushels per acre better than the per acre yield average over the ten years 1954-55 to 1963-64.

Production for 1964-65 was 29,011,000 bushels more than the previous record, 1963-64, and 84,459,000 bushels more than the average annual production over the ten years from 1954-55 to 1963-64.

Receivals of wheat from the 1964-65 harvest by the Australian Wheat Board in New South Wales totalled 137,276,000 bushels (129,338,000 bushels or over 94 per cent in bulk, and 7,938,000 bushels in bags), compared with 110,467,000 bushels the previous year. The remainder of the grain harvested was either delivered through New South Wales Stations to the Victorian Railway System, delivered to border stations in Victoria, or retained on farms for seed and feed purposes.

Only 2,500,000 bushels was received at a dockage. Almost 7,000,000 bushels commanded a premium.

Grain acreage and production were greatest in Southern Division; 40 per cent of the State acreage and 38 per cent of the State production. In Northern Division the proportions were 28 per cent of the acreage and 32 per cent of the production. In Central Division the proportions were 32 per cent of the acreage and 30 per cent of the production. Highest per acre production was in Northern Division; followed by Southern and Central in that order.

Premium Wheats.—Higher prices were paid and for a bigger quantity of premium wheat in 1964-65. At 6.3.65 local premiums totalled £456,693 on a total of 4,401,790 bushels; in the previous year the figures were £217,546 and 2,973,698 bushels.

Hard, bread wheat varieties (3,274,754 bushels) comprised the greatest quantity of local premium purchases. Soft variety, local premium sales totalled 1,054,843 bushels. Premiums were paid on 72,193 bushels of durum wheat.

Premium average for hard bread wheat varieties was 31.35d. per bushel (21.9d. in 1963); 4.76d. for soft varieties (3d. in 1963); and 26.4d. for the durum wheat Dural (30.6d. in 1963). Highest premium bid for an individual parcel was 79d., for Windebri and Koda.

Highest premium averages were for Winglen (52.75d.), Festival (41.92d.), and Windebri (40.82d.).

Most popular hard, bread wheat varieties as gauged by premium acceptance quantities were Mengavi 29.84 per cent; Gamenya 18.35 per cent; Spica 15.63 per cent; Koda 7.78 per cent; Windebri 5.84 per cent; and Falcon 4.45 per cent. These six varieties totalled 83 per cent of the hard, bread wheat premium deliveries.

Two varieties, Pinnacle (49.56 per cent) and Heron (19.96 per cent), accounted for almost 70 per cent of the soft variety deliveries for which local premiums were paid.

A further 2,100,000 bushels of wheat tested for protein were received at selected receival points for eventual sale locally and/or overseas.

F.A.Q. Standard.—For 1964-65, again, two F.A.Q. Standards were declared. Both were for bulk wheat. One was for northern F.A.Q., at 64¾ lb per bushel Schopper weight; compared with 63¼ lb per bushel the previous year, and equalling the record weight of northern F.A.Q. wheat in 1956-57. The other F.A.Q. standard was for southern and western wheat combined, at 64½ lb per bushel; compared with 64¼ lb per bushel the previous year.

Unusually fine weather over the harvest period resulted in wheat grain generally being well filled, attractive, and considerably lower grain moisture content than for some years past. The sample was more than usually free from weeds.

Wheat protein content of the F.A.Q. (Northern 10.4 per cent and South-Western 9.9 per cent) was well below that of the previous year; understandable in view of the high yields per acre. The previous year's figures were 11.5 per cent and 10.5 per cent.

Wheat Variety Popularities.—The latest available census of wheat varieties (1963-64 season) shows important changes in popularities since the 1962-63 census.

Glenwari, the leading variety for four years fell from first to fourth place; 8.6 per cent of the acreage. Heron rose from third to first place; with 14.3 per cent of the acreage. Mengavi (10.9 per cent) is now in second place and the most popular in the north west. However, Mengavi is expected to decline in favour of Mendos—similar in yield but resistant to all prevalent stem rust strains.

Olympic (8.8 per cent) dropped slightly in popularity, reflecting toughness in stripping. Gamenya (7.7 per cent) and Falcon (7.3 per cent) are now in fifth and sixth places; having doubled their areas since the previous season. Their acreages are expected to continue to increase.

Wheat Variety Recommendations.—Only minor changes were made for the 1965 season.

Eureka and Warigo were deleted from recommendations for Northern and North Western Regions and the western part of Western Region, in favour of Festiguay. Festiguay yield at least equals Warigo and Eureka. It is resistant to all prevalent stem rust races and will escape damage from normal winter frosts when sown early. Festiguay was substituted for Eureka in irrigation areas where rust is significant.

Mengavi was deleted from recommendations for Northern and North Western Regions, in favour of Mendos. Unlike Mengavi, Mendos is resistant to all prevalent stem rust races. Also Mendos baking quality is superior to that of Mengavi and similar to that of Gabo.

Winter Wheats.—The Departmental winter wheat varieties Winglen and Windebri, though grown on a significant area, mainly in the north (138,000 acres in 1963-64), have not much expanded their acreage in the past two years. This is due mainly to susceptibility to prevalent stem rust strains.

Acceptability of these varieties as premium quality wheats was further demonstrated in 1964-65. Good premiums were paid for 200,000 bushels of Winglen and Windebri.

The highest premium average paid for hard, premium wheats in 1964-65 was realised by Winglen (52.75d. per bushel). The highest individual bid for a hard, wheat variety was for a parcel of Windebri (79d. per bushel).

Durum Wheats.—Premium purchases of the Departmental durum variety Dural in 1964-65 (72,193 bushels at an average premium of 26.4d. per bushel) were well down compared with the previous year (155,800 bushels, at an average premium of 30.6d. per bushel).

Acreage sown in 1964-65 changed little compared with the 4,685 acres recorded for the previous year. Conditions throughout the spring and early summer of 1964 did not particularly favour production of high quality Dural wheat, and few growers realised premiums at the top of the range offered.

Demand for durum products has steadily grown. This should continue. Brakes on expansion are lower yield and later maturity of Dural compared with early maturing bread wheats grown in the northern premium areas. These drawbacks may disappear in due course, further to the appointment in early 1965 of a plant breeder at Tamworth Agricultural Research Station to work full time on durum wheats. Funds for this came from the Wheat Industry Research Council.

Wheat Quality.—Chemistry Branch, Division of Science Services, co-operated in quality testing of new varieties under field test. Some 700 grain samples from numerous centres throughout the Wheat Belt were submitted for milling and baking tests. Besides these routine Departmental tests, three promising crossbreds being considered for possible release or recommendation were uniform quality tested by collaborating laboratories.

The Cereal Specialist judged the bench characters of wheats in the open classes at the 1965 Sydney Royal Show. There were 78 entries, compared with 52 in the previous year. Best samples in the main classes were of a high standard. The rest were mediocre. Top bushel weight was 69 lb per bushel for an entry of Spica. Outstanding entries in their classes were the Departmental varieties Festival, Falcon and Heron, and the Queensland variety Spica.

Judged on milling and baking characters combined, a sample of the Departmental variety Festiguay grown at Narrabri was champion strong bread wheat; a sample of the Departmental variety Falcon grown at Goonumbla was champion medium strong bread wheat; and a sample of Olympic grown at Narromine was champion soft bread wheat.

Wheat Variety Trials.—Trials at Research Stations and on farmers' properties provided useful information on yield, adaptability, agronomic aspects, also milling and baking quality of new and established varieties. In 1964-65, randomised and replicated variety trials were conducted (previous year's figures in brackets) with 65 (70) farmers, working under supervision of 19 (21) District agronomists throughout the wheat belt, testing a total of 22 (22) varieties. In addition, detailed wheat variety trials were conducted at six Research Stations in the wheat belt. In these a large number of promising crossbreds and new varieties were compared with standard varieties.

Detailed wheat variety recommendations for all districts were prepared in light of results from these trials.

Wheat Variety Performance.—New varieties tested included Festiguay, Mendos, Emblem, Olympic A103, and the unnamed crossbred K.F. Heron.

Festiguay yielded superior to Eureka and Warigo in northern trials. It is midseason to late in maturity and when grown at normal temperatures resists all rust races in the field. It has higher cold need than other varieties. So, it can be sown early and escape damage from normal frosts. But in central and southern areas Festiguay was inferior to varieties of similar maturity, such as Olympic.

Mendos yielded inferior to Gamenya but about equal to Mengavi and Spica. Mendos resists all prevalent strains of stem rust and has baking quality closer to that of Gabo. In central and southern areas Mendos yielded inferior to all of the recommended varieties—Falcon, Heron and Gamenya.

The as yet unnamed crossbred KF Heron, similar to its recurrent parent Heron in most respects but with earlier maturity, and resistant to some of the prevalent stem rust races, was compared with Heron in central and southern areas. It yielded better than Heron and is most promising.

Emblem was compared with Heron, Falcon and Gamenya in southern and central areas. It was clearly superior to Gamenya and Falcon in yield and at least equal to Heron. But it has very hard grain and is over stable in baking quality. It has been withdrawn from further trials.

Olympic A103 was compared with Olympic in many trials in central and southern areas. Despite a slightly lower yield overall it will replace Olympic because of greater uniformity.

The season favoured late maturing varieties. So, in southern and central areas Olympic was the outstanding recommended variety. In other years Heron has been slightly the better.

Soil Fertility and Rotation Experiment.—This trial, at Condobolin Research Station, has now completed its ninth year. The last season was favourable—wheat and oat yields were generally 25 to 30 bushels/acre. Less grazing than usual was obtained from the pasture. Conditions did not favour pasture except for a brief winter period. Skeleton weed and barley grass in the pasture plots reduced the growth of other species. Assessment of results in this long term experiment will not be possible for some years.

Other Rotation Trials.—Comparison of volunteer and sown pasture and their effect on subsequent wheat yields continued at Trangie Research Station. As the pasture phase ended in 1963, fallow treatments were carried out in 1964 in preparation for sowing the cereal plots in 1965.

Applied Wheat Fertilizer Research.—This was extended to cover more adequately all main sections of the wheat belt. A factor in record production was marked increase in fertilizer usage by wheat growers. A result of earlier research, superphosphate was applied on many paddocks not previously fertilized; and at heavier rates in regions already accepted as low in soil phosphorus. Nitrogenous fertilizers were used on many wheat crops for the first time; with superphosphate.

Wheat Fertilizer Trials.—The first stage of wheat fertilizer trials conducted from Tamworth Agricultural Research Station in the north west, has been completed. These trials extended over three years; mainly concerned with reaction of various soils to superphosphate. Soil analyses for phosphate were done to determine any correlation between soil phosphate content and superphosphate response. Results of these trials are now being analysed with a view to publication. As a result of these trials, northern farmers are being encouraged to have their soils tested for soil phosphate—to enable a reasonable assessment of phosphate to be applied.

The first year of fertilizer trials in the central west has been completed. Fewer trials (10) than expected were carried out. The results have yet to be analysed. A preliminary conclusion is that assessments made from the soil phosphate tests are higher than yield results would indicate. Nitrogen tests had given a fair indication of whether nitrogen was needed and in what amount. Also, substantial increase in protein had sometimes followed addition of nitrogenous fertilizer.

Exploratory trials were conducted on southern irrigation areas, to determine optimum seed and fertilizer rates. Interim results suggest that higher than current rates of seed and fertilizer would be profitable under irrigation.

Field Wheat Competitions.—Six Divisional championships were conducted by the R.A.S. The field judging of most local and all championship competitions was done by Departmental officers. There were 859 crops in 80 local competitions, compared with 740 in 1963. It was the highest total since 1958.

Winning championship crops were:—Northern Division, Gamenya (estimated 59 bus/acre); Northern Slopes Division, Eureka (over 65 bus/acre); Western Division, Gamenya (estimated 52 bus/acre); Central Slopes Division, Eureka (estimated 49 bus/acre); Riverina Division, Falcon (estimated 45 bus/acre); Southern Slopes Division, Olympic (estimated 60 bus/acre).

OATS

Oat Production.—The oat crop was near to record. Exceptionally high grain yield of southern crops was a feature. Some 22,885,000 bushels were harvested from 850,000 acres sown for grain (26.9 bus/acre). The record, from 1958-59, is 27,638,000 bushels of grain from 1,130,000 acres (24.5 bus/acre) and 1,627,000 acres were sown for all purposes that year.

Hay production was 102,953 tons from 66,000 acres (1.56 tons/acre). Total oat sowings for 1964-65 for all purposes (grazing, hay and grain) was 1,635,000 acres; compared with 1,627,000 acres in 1958-59. About 44 per cent was used for straight out grazing. And many crops sown primarily for grain were used also for early grazing.

Oat Variety Popularities.—Belar, for years the most widely grown variety in New South Wales, is still in first place. But its percentage of the acreage has fallen from 54.8 to 22.5 since 1956. Avon, of recent origin, noted for high grain yields, strong straw, and resistance to shattering, has rapidly increased in popularity. It is now in second place (14.7 per cent). Algerian, grown for almost 100 years, fell to third place (14.2 per cent). Fulmark released less than ten years ago, noted for good straw, and high grain yields after lenient grazing, is increasing steadily. Cooba, the most recent release, noted for prolonged grazing, if sown early, and excellent recovery, is making rapid headway. It was already in sixth place (4.6 per cent) in 1963.

Oat Variety Trials and Recommendations.—Trials throughout the State provided information on grazing and grain yield, adaptability, and agronomic aspects of new and established varieties. Randomised and replicated variety trials were conducted (previous year's figures in brackets) with 34 (44) farmers, working under the supervision of 18 (23) District agronomists, testing a total of 16 (18) varieties. Also, detailed variety trials were conducted at eight Research Stations. Oat variety recommendations for all districts were made in light of the results. Only minor changes were made for 1965. No new variety was included. No old one was eliminated.

High yields were general in the trials. The season was good, and grazing was less possible than usual—due to the wet winter. There was little disease or frost damage.

New varieties tested were V.R. Bke.F x WF W4587, V.R. Boppy, Belar W4606 and V.R. Bke W4464.

The Glen Innes hybrids W4587 and W4606 performed well. W4606 compared well with Algerian for grazing and grain. Seed of W4606 has been distributed to Registered Seed growers for preliminary seed increase, pending final decisions on its naming and release. It may become a replacement for Algerian. W4587 was named "Bundy" and is designed to replace Belar, for grazing and grain, and Avon for grain in the north west. Bundy has to be tested further against standard varieties in central and southern areas to see if it has a place there.

V.R. Bke W4464 continued to outyield all other varieties in central and southern areas. But it will be discontinued, because of mediocre grazing capacity and inferior grain quality.

Oat Improvement in Northern New South Wales.—The oat improvement programme, headquartered at Glen Innes, continued until December. The oat breeder was transferred to other duties and the programme will be in abeyance until another is appointed.

The Glen Innes winter was dry, so less grazing cuts than usual were taken. The trials had also been sown later than desirable. Thus, varieties with a tendency to produce early grazing, such as Fulghum, gave better results than such others as Cooba and Klein 69B. Several lines from the cross (Fulghum x Garry) x (V.R.A.F. x V.R.S.F.) did well compared to standard varieties.

Plant Breeding Extension Trials were sown at Tamworth, Grafton, Inverell and Narrabri. Their results have yet to be analysed. But valuable information on adaptability of the various lines over a wide area was apparent. Grazing cuts and grain yields were obtained from all of these trials, except at Grafton.

"Rates of Seed and Fertilizers" Experiment on Grazing Oats.—The effects of nitrogenous fertilizer on production of green fodder and grain recovery of oats, at two different times of fertilizer application and at two different sowing rates, were under experiment at Glen Innes. Because of the late sowing and the dry winter only two grazings were obtained in the early sown trial and one grazing in the late sown trial.

In the early sown trial a significant response at each grazing was obtained through application of 2 cwt of sulphate of ammonia/acre in April. Application of 2 cwt/acre in August gave a significant response at the second grazing in the same trial. No significant difference was shown by application of 1 cwt/acre of sulphate of ammonia in April or August in the early sown trial or by any treatment on the late sown trial.

BARLEY

Production.—Growers maintained interest in barley, for feed grain and malting purposes. Barley grain growing has expanded rapidly since 1957-58. In 1964-65, record acreages and record production were achieved. Barley sowings for all purposes totalled 273,799 acres; of which 34,093 acres was utilised for green fodder production, and 238,983 acres harvested for grain. Grain yield was 6,707,100 bushels; 4,040,460 bushels of 2-row grain and 2,666,646 bushels of 6-row grain. Hay production was 1,037 tons, from 723 acres.

Previous record barley production was in 1962-63, when 5,361,000 bushels were harvested from 221,000 acres of a total sowing for all purposes of 254,000 acres.

Barley Variety Trials.—Grain yield performance and agronomic aspects of new and established barley varieties were compared in trials at Research Stations and on farmers' properties. Randomised and replicated variety trials were conducted (previous year's figures in brackets) with 18 (20) farmers, working under the supervision of 14 (14) District agronomists, testing a total of 10 (8) varieties. Trials were conducted at two Research Stations.

Barley Variety Performances.—The season favoured late maturing varieties. Abyssinian gave the best results overall. Beecher, a new introduction, from Western Australia, performed creditably. Of the malting types, Research gave the best results. Noyep yielded well where it could be harvested at about the correct time.

CEREAL RYE

Production.—Latest available statistics are for the 1963-64 season, when 29,607 bushels of grain were harvested from 1,782 acres out of a total sowing of 6,352 acres for all purposes (including green fodder).

Acreage sown to rye in 1964-65 is expected to be higher. Grain production also increased. But it is estimated as insignificant compared with the record production of 1939-40, when 193,000 bushels were harvested from 12,196 acres sown for grain.

Increased interest in 1964 is thought to have resulted from a Sydney milling firm's price guarantee for grain contracted from the 1964 rye crop. A similar offer has been made in respect of the 1965 crop.

Seed Stocks.—Basic seed stocks of Weethalle and Strain 8 were maintained.

Publication.—"The Cultivation of Rye" was published this year.

WHEAT, OATS, BARLEY, RYE GRAZING TRIALS

At Cowra Research Station comparison of the green fodder production of varieties of wheat, oats, barley and rye continued. Because of the good season, eight cuts were made. Fulghum oats produced highest yield, followed by Weethalle rye, Ablyn barley and Winglen wheat. Over the period of the trial, oats have produced the greatest overall yield of green matter.

WHEAT, OATS, BARLEY PURE SEED PRODUCTION

Supplies of pure seed of recommended and promising varieties of wheat, oats and barley were maintained on eight Research Stations and distributed through Registered Seed Growers throughout the State. In 1964-65, foundation seed sowings on Research Stations totalled (previous year's figures in brackets) 89 (101) acres of wheat, 57 (69) acres of oats, and 20 (26) acres of barley. Additional to this, and associated with the pure seed production schemes on Research Stations, initial selection and preliminary increase of wheat and oats was conducted at Temora Research Station; of barley at Wagga Agricultural College; and of some oat varieties suitable for northern conditions, at Glen Innes Research Station.

A total of 252 registered growers participating in the Registered Cereal Seed Scheme in co-operation with the Department, disposed of large quantities of pure seed to other growers in 1964-65. Altogether (previous year's figures in brackets), 132 (139) registered seed wheat growers working under the supervision of 23 (22) District agronomists throughout the wheat belt, using foundation seed supplied by this Department, undertook seed increase of 16 (15) wheat varieties; 92 (99) registered seed oat growers in 23 (23) District agronomists' areas carried out seed increase of 14 (12) oat varieties; and 28 (28) registered seed barley growers undertook pure seed production of 7 (6) barley varieties in 18 (18) agronomists' Districts.

MAIZE

Production and Trends.—Drought caused many crops to fail and others to be used for green feed. A record low maize grain yield was expected. Much of the grain harvested was used for drought feeding. Manufacturers, unable to obtain normal supplies even at prices 50 per cent above normal, sought approval to import.

Heavy yields from isolated crops again proved the capabilities of hybrids. Four irrigated crops in the Mudgee district yielded over 200 bushels per acre. These crops received only 1 inch of effective rainfall but 20 inches of irrigation.

The trend to increased plant populations and fertilizer continued. Crops of over 200 bushels per acre had plant populations of 20-25,000 per acre. The two heaviest crops, 230 and 220 bushels per acre, received 158 lb and 125 lb of nitrogen per acre respectively.

The number of growers using herbicides for weed control, and those applying nitrogen as anhydrous ammonia, increased in irrigation districts.

Interest in mechanical harvesting, bulk handling and artificial drying of grain increased. Inland growing, with irrigation, was stimulated by the demand and good prices.

Hybrid Maize Improvement Programme.—Work continued at Grafton and Glen Innes Research Stations, to improve late and early maturing maize hybrids. Inbred lines were introduced from overseas. These were handled under quarantine at the Leeton Research Station.

At the Grafton Station, maintenance and development of inbred lines continued. One hundred and thirty-two yellow endosperm and twenty-five white, fixed inbred lines were maintained. And 143 selections were inbred for a further generation. Severe drought enabled selections for heat and drought tolerance. Seven new inbreds were fixed and named.

Eighty-nine inbred lines were included in general combining ability tests. Thirty-five were finally evaluated to predict the best double-cross hybrid combinations.

Three hundred and seventy-five maize ears representing eleven open pollinated maize varieties collected for seventeen sources were grown to select further material for inbreeding.

Inbred lines with good disease resistance recently developed at the Kairi Research Station, North Queensland, were incorporated into the breeding programme.

Dwarf lines from North Carolina, leaf and rust resistant lines from India, and promising midseason maturing lines from Tennessee were introduced.

Tests with forty-nine late maturing and fifty-seven midseason maturing experimental hybrids continued. The results were of limited use, due to drought.

Grafton bred hybrids G.H. 128, G.H. 134 and G.M. 211 were extensively used in coastal districts. Demand for seed increased.

A new hybrid, G.H. 342, again proved itself in district trials. Foundation seed was produced for its release.

At the Glen Innes Station this was the driest period for seventy years but irrigation produced satisfactory seed yields.

Open pollinated varieties were investigated there for inbred development, but the rejection level was high. Three new fixed inbreds, N.E. 1, N.E. 2 and N.E. 3 were developed from second cycle material and tested for specific combining ability. They showed much promise. Seven new inbreds were added to the list currently under advanced testing.

Selection to rectify defects with the promising inbreds C103, B15 and OH56 continued. Very promising lines were obtained. One improved line, C103A, was included in hybrid pedigrees for testing.

Sixteen new double-cross hybrids in the early maturing group whose performance had been predicted from earlier trials, and fifty-two three-way crosses and four double-crosses in the very early maturing group, were made up for testing. The very early maturing hybrids gave only two-thirds to three-quarters the yield of the standard early maturing hybrids.

A new early maturing hybrid, N.E.H.1151, was released for commercial use. This hybrid, in 7 years' testing, was agronomically better and yielded 26 per cent and 8 per cent higher than N.E.H.7 and D.S.606A respectively.

About 450 tons of grain of the hybrid N.E.H.1215wx was produced for its special waxy starch properties. Use of this starch in the canning industry has started.

Co-operation was close with the Department of Primary Industries, Queensland, in maize breeding. A full series of inbred, single-cross and double-cross lines was supplied to Kairi Reseach Station and Gatton Agricultural College to assist their plant breeders.

Male Sterility Programme.—Conversion of inbred lines to the male sterile and restorer forms was undertaken at Grafton and Glen Innes Stations. Commercial seed production of the early maturing hybrid N.E.H.7 was successfully undertaken. Seed growers built up supplies of male sterile foundation seed to produce the main, late maturing hybrid G.H.128 by the new method.

Drought made testing and seed production of converted inbred lines difficult. Limited quantities of seed were harvested from converted inbreds 21MS, C17R, C121MS and Y1MS. Complete failures with 68MS, 25R and 23R critically reduced their supply.

At the Grafton Station, twenty-seven inbred lines were at various stages of conversion and a new inbred, A31, was added to the conversion programme. Three inbreds, D21, FF1 and FF12, reached the inbreeding stage—to isolate tassel fertility forms. Attempts to isolate the NR and MS forms in the restorer line 13B continued, with little success. Isolation of inbred forms C103MS, C103A MS and C103R was achieved. Some seed was produced.

Selection to improve plant type with the improved inbreds 25R and 23R continued. Variability in tassel fertility was still exhibited in 25R and to a lesser extent with 23R. Indications were that flowering synchronisation with these two inbreds was also upset in the conversion programme. Sowings of the previous season's high tassel, fertility selections failed. Further selections were necessary. In these inbreds the possible existence of a complex of modifying genes sensitive to certain environmental conditions presented problems. So, breeding to replace the male sterile cytoplasm with normal cytoplasm has started.

Tassel fertility observations with component single crosses of hybrids G.H.128R and G.H.342 showed that the male single crosses (25R x 23R) F2 and (25R x 7) are fully male fertile, and the female single crosses (Y1MS x M1) and (21MS x FF4) completely male sterile.

Fifty-eight inbreds used in the breeding programme were classified in test crosses, for tassel fertility reaction to the "T" source of male sterile cytoplasm. Seventeen of these proved to be restorer lines.

Also at Grafton Station, a large series of test crosses involving all restorer genes identified by various inheritance investigations were studied. This was to obtain data on the allelic relationship of these genes. Tassel reactions were confused, due to dry weather, but presence of two and possibly three unrelated genes for fertility restoration in the Grafton inbred collection was indicated.

At the Glen Innes Station the conversion of early maturing breeding material to MS and R forms continued; 12 leading inbreds reached the four generation backcrossing stage. Tests proved the selected white-cored inbred 701 capable of 100 per cent fertility restoration. Test crosses with C103 progenies were inconclusive. Conversion of the improved inbred C103A to the restorer form has started.

Development of Leaf-Blight Resistant Hybrids.—Little loss from leaf blight occurred, because of the dry season. The co-operative programme between Grafton and Glen Innes Stations to develop early maturing, blight resistant hybrids was handicapped by the drought. Sixty-seven crosses between promising New England early maturing inbreds and four Grafton blight resistant inbreds, 25, D21, HB, 21H, were advanced to the F2 generation. Absence of blight prevented rating for resistance. The single crosses C103 x D21 and C103 x 21H showed promise.

Hybrid Maize Seed Certification.—Some details of the season's hybrid maize seed certification are summarised in the following tabulation:—

Hybrid Type	Growers	Acres	Bushels	Bus./Acre
Early	5	39	1,742	44.7
Midseason	5	17	845½	49.8
Late	31	424	15,687	37.0
Totals	37	480	18,274½	38.1

Production of 18,274 bushels was a 16 per cent increase over the previous season. Most interest centred on G.H.128. This comprised 80 per cent of the total seed certified, compared with 74 per cent in the previous season.

The dry season and the lower seed price curtailed seed growers' activities. Compared with the previous year there was a reduction of 100 acres in area registered for certification; with perhaps 50 per cent reduction in seed to be certified in the current season.

Popularity of hybrids G.H.128 and G.M.211 continued to rise, in New South Wales and Queensland. These hybrids again occupied most of the coastal maize areas.

New, early maturing hybrid N.E.H.1151 was included in the Certification Scheme. About 500 bushels of seed was produced in this initial year.

Production of the early maturing hybrid N.E.H.7 was successfully undertaken by the male sterile method. And foundation seed growers built up sufficient male sterile parental lines to produce the late maturing hybrid G.H.128.

Hybrid Maize District Trials.—Forty-one trials were organised; with late, midseason, early and very early maturing hybrids. Results could be expected from only about half of them, due to the drought.

The Queensland Department again co-operated, by testing Departmental hybrids and inbred material in the north of Queensland. Hybrids G.H. 128, G.H. 134 and G.M. 211 again did very well. Experimental hybrid G.H. 342 again proved itself.

DeKalb Shand Seed Company hybrids performed well in trials. They were popular with commercial maize growers. Hybrids D.S. 606A, D.S. 65A, and D.S. 601 occupied most of the area sown in the Mudgee district. N.E.H. 7 was the most popular in Gundagai-Tumut district.

SWEET CORN

Production.—About 1,500 acres were sown to sweet corn in the Tumut, Gundagai, Windsor, Richmond, Bathurst, Mudgee and Cowra districts; contracted to canning companies. Heavy irrigation was needed. Yield average was 3-4 tons.

The hybrid Iochief occupied most of the sown area. Some firms were interested in Golden Cross Bantam.

Introductions and Improvement Work.—Sweet corn quality occupied some attention. Two firms handled introduced inbreds, with a view to quality improvement of hybrids.

Small quantities of the super sweet lines of Iochief and Golden Cross Bantam, namely Illingchief and Illinggold, were produced for further testing. But under our conditions the handling of their parental material was difficult.

Three sweet corn inbreds from Tennessee were handled at the Glen Innes Research Station. Only one line showed prospects. This one was phenotypically very similar to inbred P39 used in Golden Cross Bantam production. Small quantities of Tenngold 2 and Tenngold 5 were developed for testing.

Under quarantine at the Yanco Research Station seed of the sweet corn hybrids Iochief and Golden Cross Bantam were produced with American parental material reported superior. Little difference was apparent between the new inbreds and those in current use.

Certified Sweet Corn Seed Production.—Thirty-three acres were registered. Of this area, Iochief was 30 acres. The adverse season reduced production of certified seed to about 75 per cent of the previous season's.

POPCORN

Production.—Popcorn production was reduced by the drought. About 1,000 acres was sown. Only 10 per cent was harvested.

Local consumption of popcorn increased. New popcorn packs were marketed. Export of unpopped material occurred.

Improvement Work.—Research with popcorn was restricted to development of MS and FR isolates of inbreds SAA1-6, SA1490-3 (parents of N.E.P. 37), S.G. 18 and AP5; and to the extraction of a tall non-suckering strain of SA1490-3.

GRAIN SORGHUM

Production.—Drought conditions caused failure. The harvest was the lightest for ten years. Much of the area sown was used for grazing. Some irrigation crops were baled to relieve the fodder shortage. Yields of 4 tons per acre and prices of £15-£20 per ton were obtained.

Some farmers have become interested in row cropping, and rotation with cotton.

Hybrid Sorghums.—Development has been rapid. Big increase in seed production has enabled almost complete changeover to hybrids. Trials again proved some hybrids to be 25-30 per cent better yielders. Tx610, very adaptable, has become the yardstick.

Co-operation with the Queensland Department in hybrid sorghum improvement has been close. Private firms were helped with testing. Tests showed that hybrids doing well in Queensland would do so in New South Wales and vice versa

Private firms, DeKalb Shand Seed Company, Arthur Yates Pty Ltd, and Pacific Seeds Aust. Pty Ltd, entered the hybrid sorghum seed production field. Each produced hybrids for commercial use too rapidly for Departmental testing. But observations showed that new DeKalb, Northrup King and Pioneer hybrids handled by the private firms, had possibilities here. Tx610, Brolga, Tx608, E57, F63A, ANK6372 and ANK6374 did well in trials, under drought and irrigation.

Seed Certification Scheme.—Production was restricted to 600 bushels of Tx610, because of the limited demand and private firms' increasing activity.

Hybrid Sorghum Breeding at Tamworth Research Station

Big increase in hybrid grain sorghum seed production has enabled almost complete changeover by farmers to hybrids. Trials have shown hybrids that offer farmers 25-30 per cent yield increases. Availability of forage sorghum hybrids has also captured farmer interest

Introductions, etc.—Research Station facilities were used to observe introductions, maintain male sterile lines, and make up seed of experimental hybrids. Quadruple dwarf, smut resistant, yellow endosperm and reported midge resistant lines were given attention.

FORAGE SORGHUM

Hybrids' Effect.—Availability of hybrids increased interest in forage sorghums. But sowings were restricted by the drought.

Seed supplies of the DeKalb Shand Company hybrid Sudax increased. It again gave excellent results.

Improvement Work.—Research with experimental sweet sorghum and sudan grass hybrids continued at the Tamworth Research Station. All available male sterile and restorer lines were combined and tested. Growth curve studies indicated that hybrid sorghums could be used to advantage in feed year planning in the north and, with irrigation, in the south.

Male sterile lines A378 and A3048 showed the best possibilities among those available for hybrid development. Hybrids with sudan grass as the pollinating parent were superior in grazing and in silage yield to those with sweet sorghum as the pollinator.

Seed Certification.—Seed of the Departmental hybrids Calala (A378 x Lahoma sudan) and Nemingha (A3048 x Lahoma sudan) were produced under certification. Seed of the Queensland Department's hybrid Zulu became available to producers in larger quantities while Arthur Yates Pty Ltd, handling American Northrup King material, commenced seed production of the hybrid Trudan.

Comparison Trials.—Hybrids Calala and Nemingha over two seasons at the Tamworth Station averaged 154.1 cwt and 140.9 cwt. dry weight per acre respectively, compared with Sudax 118.8 cwt per acre.

At the Narrabri Research Station, in growth curve studies under irrigation there was little difference between released hybrids Calala, Nemingha, Zulu and Sudax. Under simulated trial grazing conditions, Sudax just exceeded Calala for total dry matter from three harvests, with Zulu and Nemingha close up. Where trial conditions simulated silage cutting, Calala and Nemingha were about even, and superior to Zulu and Sudax, in dry matter from two harvests. Dry matter yield from hybrids under irrigation at the Narrabri Station ranged between 25,000 and 30,000 lb per acre.

Sudan Grass.—S.S.6 sudan grass was certified. It occupied most of the sudan grass area sown. Piper sudan gave much promise under irrigation, and its rapid recovery after grazing drew attention.

Sweet Sorghum.—Sweet sorghum acreage was low, due to dry conditions and increasing interest in hybrids. Only 42 acres of sweet sorghum varieties were registered for certification, compared with 131 acres and 144 acres in the two previous seasons. Sowings comprised Early Orange, Saccaline and Tracey.

BROOM MILLET

Production.—Production of about 600 tons, in the Tumut, Lismore and Maitland areas, compared to last season.

Improved White Italian Strain.—Acreage of this strain was greater. Demand for its seed increased. Buyers preferred its crops because of the fine hurl with good length and strength.

FODDER AND GRAIN MILLETS

Production.—Commercial crops of millet grain failed and local supplies for bird seed were unprocurable. Attempts to produce Starr Pearl Millet seed in N.S.W. for grazing were unsuccessful.

Seed Production and Improvements, etc.—A Pearl millet strain finally selected at the Tamworth Research Station was earlier, and seed production has commenced.

Trials indicated that Japanese was still the best variety available for early grazing, with Siberian suitable in northern areas as the season advanced. Dwarf Setaria was better than Giant Setaria for grain.

Forage Crops

VETCHES

Research and Extension Expand Production.—Farmer interest and the acreage sown throughout the north coast increased, mostly to Golden Tares. Wollongbar Research Station work made possible a fertilizer recommendation covering all soil types and paddock cropping histories, for north coast vetch sowings.

The two main diseases affecting vetches on the north coast have been categorised, "root rot" and "decline". Their causes are still being studied. Later sowing dates tended to reduce their effect. Cropping history affects the root rot severity.

COWPEAS

Production and Variety Trends.—The season was against cowpea grain production. The harvest was practically nil. Crops sown for grain and seed were grazed. Poona occupied most of the area sown to cowpeas. Caloona acreage for seed purposes increased. Malabar increased in popularity for coastal grazing.

Demonstrations throughout the coastal belt proved Malabar superior to Poona for disease resistance. But Dolichos lab lab, seed more readily available, widely replaced cowpeas and proved better for disease resistance.

Rice

Industry Trends.—The 1964-65 rice yield estimated at 150,000 tons, from 61,607 acres, is the fourth consecutive record. It follows yields of 133,489 tons in 1962-63 and 140,000 tons in 1963-64. Better methods and increased acreage for irrigation have doubled paddy rice production in the past 10 years. Total returns to growers from the 1964-65 crop should be at least £4,000,000.

Coleambally Irrigation Area contributed most of the increased area in 1964-65. A further increase of 2,000 acres is anticipated there in 1965-66.

Rice growing in New South Wales was based for many years on the short grained variety Caloro II. But changing tastes at home and abroad have required the growing of medium and long grained varieties. Acreage of Calrose, a medium grain, is now only slightly less than acreage of Caloro II.

Bluebonnet 50 has provided a long grained variety but has field limitations. Bluebonnet 50 x Calrose selections are better in yield and maturity. Two bulked selections from this cross have been provisionally released for pure seed production. Meanwhile the Rice Marketing Board is encouraging farmer interest in Bluebonnet 50 by offering farmers £55 per ton for it.

Receival of rice in bulk at higher moisture content follows research done by this Department into improved milling quality resulting from the practice. The bulk handling trend has been extended to bulk storage of pure seed at Deniliquin.

Industry co-operation with this Department, particularly through the Rice Investigations Sub-Committee of the Irrigation Research and Extension Committee is fine. The Department's rice research programme has been subsidised by this organisation since 1956. Co-operation in field trials and fertility surveys is excellent.

The ready acceptance and application of research results has had a big influence on per acre rice yields. These are the highest in the world.

Breeding and Improvement.—Quarantine of rice introductions at Hawkesbury Agricultural College helps to sustain the rice industry's unique disease-freedom. Fifty-nine introductions cleared by quarantine were appraised this year for salt and cold tolerance and as breeding material. Previously cleared introductions were field tested with several promising japonica varieties.

Highlight of the breeding programme was provisional release of two bulked lines of long-grained rice for seed increase by the Rice Marketing Board. Their code numbers are YRL 1 and YRL 2. A third bulked line was withdrawn, lacking uniformity. These higher yielding Bluebonnet 50 x Calrose lines can now be used by the rice industry to replace a Bluebonnet 50 which lacked performance qualities. The bulked lines appear superior to the long-grained indica types.

Many new crosses were made, and selection of advanced material up to F 10 continued.

The Department and the CSIRO are now co-operatively quality-testing rice on an international basis.

Rice Soil Testing.—Soil samples from 190 rice blocks were analysed for indications of fertilizer requirements. High correlation between fertilizer recommendations and rice yields was apparent.

Cotton

Rapid development of cotton growing, promising major industry status, has been a highlight of agricultural trends in N.S.W. this season. High production has provided impetus for immediate future expansion.

Production Trends.—From 97 acres in 1959-60 the area sown to cotton rose to 2,359 acres in 1962-63 and 11,000 acres in 1963-64. In 1964-65 the harvested area was 18,000 acres; 15,000 acres of this in the Narrabri-Wee Waa area and most of the rest in southern irrigation areas. Small crops totalling 240 acres were grown in the Lachlan and Macquarie river valleys.

Growers have indicated that 1965 sowings will amount to at least 21,000 acres in the Narrabri-Wee Waa area and 4,000 acres in the southern irrigation areas; a 50 per cent increase overall.

Yields of up to 1½ bales of lint per acre in experiments in the Macquarie river valley are encouragement for cotton growing there, sufficient to warrant a local ginnery. Provision of irrigation water by the Burrendong Dam should in future years provide for large areas. Intended area for 1965-66 sowing is at least 500 acres.

The irrigation potential of established water conservation in N.S.W. would permit production of Australia's entire requirements of raw cotton. Availability of suitable land area adjacent to the Namoi River is diminishing, but plains soils offer possibilities if irrigation water is available. In southern irrigation areas the limit placed by suitable land and irrigation water is far from reached. And the Macquarie and Lachlan river valleys offer immense possibilities.

Yields and Ginning.—The average yield of lint was 1.8 bales per acre in the Narrabri-Wee Waa area. Some portions yielded as high as 2.7 bales per acre. Southern irrigation areas' yields averaged one bale of lint per acre. There was some failure in boll-opening due to mild temperatures. The Lachlan area's crop produced one bale per acre. The Macquarie area's crops yielded 1-1½ bales per acre and would have been heavier but for cultural and irrigation mistakes.

Seasonal conditions in the north west were ideal for cotton maturing and harvesting. The fibre was above world average quality, and lint yields were as high as 40 per cent.

Ginneries operated at Wee Waa, Narrabri and Darlington Point. The first-named two exceeded capacity; 16,000 bales ginned at Wee Waa, and 12,000 at Narrabri. Three new ginneries have been projected; Merah North, Myall Vale and Narrabri. Ginning at Darlington Point was well within plant capacity.

Commonwealth Bounty.—The Raw Cotton Bounty Act of 1963 took effect on 1st January, 1964, and applied to the season's crop. The bounty is based on lint quality and a scale of discounts and premiums below and above the payment of 16.125 pence per pound for "middling one inch white". The base level and scale of the bounty are to be determined annually. Premium grades of one and one-sixth inch white staple were produced in the north west.

Continuation of the Commonwealth Bounty is strong incentive to an increase in cotton acreage. It provides one-third of gross returns on "middling one inch white" to farmers. Based on this, one bale of such a grade of cotton per acre grosses about £100 per acre—with nett return of about £40. Without the bounty, 1½ bales per acre would be necessary to give that nett return. This yield was exceeded by north western cotton crops. By using better methods and varieties this could be commonplace in all areas.

Fibre Testing Laboratory.—The Cotton Fibre Testing Laboratory has yet to be erected at Rydalmere. Meantime the officer-in-charge has continued fibre testing work at the University of New South Wales. A research programme has been planned and is proceeding as far as practicable pending the permanent laboratory accommodation at Rydalmere.

Cotton Breeding and Improvement.—The cotton breeding and improvement programme at Narrabri Research Station comprises selection, selfing and cross-breeding. This season 21,500 flowers were bagged, and 25 per cent formed bolls.

Pure Seed.—The work of this Department has proven and made available Deltapine Smoothleaf. This variety has the reputation of producing half a bale more per acre than the previous standard variety Empire 289. In 1964-65 Deltapine Smoothleaf occupied 90 per cent of the area sown to cotton.

Investigations at Yanco.—The 1964-65 season was generally cooler than preceding seasons, despite lack of rainfall; compared with flowering and boll opening dates in the previous three years, this year showed a difference of 10 days.

Irrigation trials confirmed previous findings that "high water" regime is needed for maximum yields.

This year the irrigation "cut-off" trial demonstrated significant and economic yield increases when "cut-off" was delayed from early February to early March. The 1965-66 trial will include irrigation cut-off in early April.

Tolex and atlacide were the most successful of four defoliants tried. They will be tested further in 1965-66.

Variety testing proceeded in three stages; progressively screening 24 varieties in Stage I, five in Stage II, and ten in Stage III.

In Stage I: Austin 64-120-71, Acala 44-64-0-35, Deltapine 15 x E WR F5 62-60 and Hy 15 x Deltapine 15, F4 21-61, were most promising. Stage II trials were unsatisfactory because of poor plant population. In Stage III: Dunn 7, Deltapine Q and Rex repeated their good performance of the previous season.

Other investigations at Yanco included trials of: polythene mulch; seed dressings; plant population; fungicide side-effects; and district fertilizer responses.

Investigations at Narrabri.—Wet conditions early in the season necessitated sowing on semi-furrowed land. But the cotton programme was not delayed.

An irrigation "cut-off" trial indicated, for this unusual season, that early March "cut-off" produced the highest total yield and the best first pick.

Three Stage III and two Stage II variety trials were conducted. Deltapine Smoothleaf was outstanding. Stoneville 7-02, Dixie King 27 and Dunn 7 performed well.

Fertilizer trials indicated a need for 80-100 lb of nitrogen per acre, depending on soil type and situation.

Trifluralin performed best of the herbicides tested against grasses and *Tuibulus* spp.

Insecticidal trials against rough bollworm and other pest species were conducted. The standard, Eudrin, remained outstanding for rough bollworm. Gusathion and seven showed promise.

Demonstration and Extension.—Field variety trials were conducted in districts with any possible potential for cotton, particularly in terms of irrigation. Successful growth of cotton was demonstrated at Bourke, Brewarrina, Narromine and Warren.

Milling Problem.—A mill difficulty in spinning cotton from the north west was reported; thought to be caused by honeydew from aphid activity. This aspect may require research and extension activities.

Tobacco

Industry Trend.—The area planted to tobacco in New South Wales fell by 15 per cent on last year's area; from 2,835 to 2,412 acres. Yield average was below 1,000 lb of cured leaf per acre and leaf quality was lower; results of the dry season.

Bulk of the 1964-65 crop was grown near Ashford and Tamworth and on the Dumaresq River. Less than 100 acres of tobacco was planted in the previously productive area on the Murray River at Barham.

Leaf sold at an average of 1s. less per lb than in the previous year, and a large percentage of growers sold only minor quantities of their leaf—at disappointing prices. Many growers, particularly sharefarmers, have indicated that they will not again grow tobacco. Further decline in acreage is therefore probable, unless recent Federal Government measures attempting to stabilise marketing and prices encourage farmers to remain in the industry.

Research and Extension.—A research agronomist and an extension agronomist are located at Ashford.

Nutritional needs of tobacco, and control of diseases and pests are being investigated. Leaf flavour and aroma, effects of the chemical applications for disease and pest control, are under investigation. So, too, are the influence of weedicides and desuckering compounds on yield and quality.

The extension service tried to provide at least two visits to each tobacco farm in the north. Radio and press were also used.

Extensive testing of irrigation water for chloride content was necessary because of the drought. Some high chloride levels were found in waters being used to irrigate tobacco.

Development of Ashford Tobacco Research Station.—The surveying, equipping and preparation of the Station has progressed. A full investigational programme now seems a 1966 probability. Finance for the Station is being provided by the Tobacco Industry Trust Account.

Miscellaneous Oil and Fibre Crops

LINSEED

Industry Over-Production.—The approximate 50,000 acres sown in 1964 was a record. Yield average in New South Wales was near 15 bushels per acre; for a total of 12,000 tons of linseed. Outstanding 36 bushels per acre yields were attained in commercial crops of Bonnydoon and Calar.

The crushers' total annual requirement of linseed for Australia was defined as 28,000 tons, compared with the 1964-65 crop yield of 49,000 to 50,000 tons. Linseed on hand will completely meet home consumption of linseed oil for the next two years.

This over-production situation seriously threatens the linseed growing industry in the 1965-66 season, but current weather has in any case considerably restricted crop possibilities in New South Wales.

Agreement could not be reached among growers concerning formation of a pool with a Commonwealth Government contribution of £50,000 for the 1965-66 season. Consequently, crushers have issued quotas for home consumption linseed to be bought at normal guaranteed prices. The surplus will be brought only at world-parity, export prices. The New South Wales quota is 8,000 acres. Of this, 4,000 acres is allocated south of the Murrumbidgee River; mainly to irrigation farms.

Variety Testing and Improvement.—Work continued on the World Collection of Linseed Varieties (over 2,000 lines) previously reduced to about 400 lines.

Promising material has been passed on to Stage I trials at Narrabri, Cowra and Glen Innes. In these trials 100 lines were treated. Varieties giving consistent performances were C 1118, Redwood, Zona, Rosafe and Wills.

At Glen Innes, Stage II trials were carried out with 30 lines.

Stage III variety trials throughout the State showed consistent, superior performance by Bonnydoon. Good results were obtained also from Calar and Marine.

There is now no linseed breeder working for the Department. Production of new material and triplicate (Stage I) testing must therefore cease, and tests must be confined within the World Collection.

For the 1965-66 season, seed has been distributed for the following 15 trials: variety trials (Stage III) at Leeton, Narrabri, Cowra, Temora and Condobolin Research Stations; and in the Barham, Coonabarabran, Dubbo, Fimby, Griffith, Gunnedah, Inverell, Leeton, Moree and Parkes districts.

Cultural Trials.—"Time of sowing" trials, with sowings fortnightly from early April to late June, have been scheduled for Temora and Narrabri under raingrown conditions.

Further to the zinc deficiency incidence in linseed trials at Narrabri in 1964-65, two trials are to be sown in that soil environment in 1965-66.

Rate of seeding/population trials, using Bonnydoon, have been programmed for Narrabri and Leeton.

Pure Seed Production.—Various phases of pure seed production for commercial varieties and promising new material are to be carried out at five Research Stations.

SAFFLOWER

Scope for Production Increase.—In recent years Safflower production in Australia has represented only about 14 per cent of the country's annual safflower oil needs. Consumption has risen to near 1¼ million gallons per year.

The 1964-65 sowing in New South Wales was about 2,750 acres, mainly in the Moree and Griffith districts. The acreage was much greater than in the two previous years. Gila has given good yield and oil contents results in recent trials but shattering was general. Yields reached a maximum of 35 bushels per acre but the yield average was much lower. Failures were largely due to heavy soils at Griffith and to weeds at Moree.

Variety Trials.—Variety trials were conducted at six centres. Pure seed of safflower has been produced since 1962 for variety trials. Eleven varieties were seed-increased at nine centres in 1964-65, for use in trials in 1965-66.

Variety trials are scheduled for three districts in 1965-66.

Research Programme at Leeton.—At Leeton Research Station a "row spacing and seeding rate" trial indicated that 7 in and 14 in spacings, and seeding rates of 40 to 60 lb per acre produced best yields. The heavier sowing rates induced production of fine-stemmed plants. These were easier to harvest than those with coarser stems produced by lower sowing rates.

In "time-of-sowing" trials, no difference in yield was noted between sowings from May to August. Later sowing produced lower growth which made harvesting easier. Sowings later than August were unproductive.

Yields were good following a rice crop although land preparation was difficult.

Further trials of "time of sowing" and "row spacing/seeding rates" are to be carried out at Leeton.

Pure Seed Programme.—In 1965-66, eight centres will be involved in pure seed production of eleven lines.

SOYBEANS

Scope.—Australia's commercial production of soybeans is negligible compared to the annual consumption of over one million gallons of soybean oil and subsidiary use of flour and meals.

Variety Classification Needs.—Successful extension of soybean growing in U.S.A. is based on critical classification of varieties into groups suiting particular latitudes.

In New South Wales there is distinct climatic variation. West of the Great Dividing Range, length of growing season increases from south to north with a secondary increase from east to west. To classify varieties of soybean in relation to New South Wales conditions, trials are continuing at Narrabri, Glen Innes, Yanco and Leeton Stations. At Glen Innes the early maturing, Kent variety was most successful. In the longer season areas, Narrabri and Leeton, Kent was out-yielded—particularly by Lee.

Variety grouping trials were also carried out on farmers' properties, at Glen Innes, Bourke and Leeton.

Further refinement of grouping of varieties, and concurrent yield testing, is projected.

Introductions.—Twelve introduced varieties in quarantine at Bathurst Research Station have yielded disease-free seed.

SUNFLOWERS

Discouragement Factors.—Current sunflower seed production is mainly for the birdseed trade. Low oil content of current commercial material and consequent prices offered by oil seed crushers have not encouraged farmers to enter production on a large scale.

Introductions and Seed Increase.—Oil analyses of twenty-one lines introduced from overseas show that some have oil contents as low as the present commercial material here (25 per cent approximately). But three Russian lines yield over 40 per cent. Many others have highly satisfactory oil contents.

These lines have been seed-increased in isolation at thirteen centres. New introductions are being grown in quarantine at Hawkesbury Agricultural College.

CASTOR BEANS

Variety Trials.—Castor bean variety trials continued at Yanco Station. The main objectives are yield, oil content, short fine stalks, desirable capsule type, resistance to shattering, and adaptability to mechanical harvest. Ten varieties were sown but shattering was general. Mauthner's Dwarf, however, showed promise in yield and shatter resistance.

Seed Increase.—Seed increase of recent introductions was accomplished in isolation at other stations.

SESAME

Introductions and Seed Increase.—New varieties introduced from Morocco were sown for seed increase at various stations. Germination was invariably poor. But all except Moradi 760/6 produced some seed.

RAPE SEED

Introductions and Seed Increase.—Four introductions were made from Holland. Three of these will be seed increased in the coming spring. These lines cross readily with natural species. Therefore, selection of sites for growth in isolation is proving difficult.

PYRETHRUM

Little Scope.—Tests in 1963-64, of the pyrethrin contents of various lines of pyrethrum, justified the belief that pyrethrum production has little or no economic future in New South Wales.

RAMIE

Nucleus Stock.—Wollongbar Research Station has retained half an acre of ramie as nucleus stock.

LAVENDER

Selections Retained.—Twenty selections of lavender are being retained at Glen Innes Research Station. Flour samples have been forwarded to the Director, Museum of Applied Arts and Sciences, for qualitative analysis.

Vegetables

GENERAL

Nine New Releases.—Progress in the improvement programme has been marked this year by release of nine new varieties. These comprised two dwarf tomatoes (Yanco Premium and Yanco Juicemaster), four stringless beans (Bland, Turon, Leeton and Yanco), and three pea varieties (Yanco Choice, Yanco Packwell and Yanco Early). Most of these were developed to meet needs of the processing industry. Also, the beans' and tomatoes' resistance to virulent diseases vests them with special value.

New Selections.—Besides the named varieties, several new selections of rockmelons, potatoes, string beans and tall growing tomatoes have shown great promise. Their release is foreshadowed.

The New Research Station at Orange.—Progress of research facilities, fencing, and land clearing, also foundation seed production have been notable at the new Station. Sufficient yields of leafroll-free seed were obtained from clonal selections of popular commercial varieties to permit large scale seed increase for commercial supply next season.

The Vegetable Improvement Committee.—Again this has been a useful vehicle of co-operation between pathologists and plant breeders. Methods of testing for disease reaction, of major importance in vegetable breeding, have reached a high plane of efficiency. Mutual interests have enhanced individual breeding programmes.

POTATOES

Breeding for Improvements.—Potato breeding continued at the Glen Innes Research Station on much the same lines as in previous years. About 200 crosses were made, for a harvest of 800 seed balls. The breeding lines used were mostly of proven continuing ability; together with some yet to be proven as useful parents.

Female parents used extensively included Superior, Fundy, Bounty, Blanca, B575-76 and 96-56 from the U.S.A., and a wide range of locally developed lines including Monak, S2782 (Placid x Crana) and S2905. Some use was also made of some Pentland lines from Scotland.

As male parents, apart from a few lines from U.S.A., including Menominee, Katahdin and 96-56, a wide range of lines developed in the Glen Innes breeding programme was used.

The number of *first year,* glasshouse *seedlings* grown was less than last year. But seedlings from a total of 240 lines were produced. A lot of promising material showed up. The best progenies resulted from the crosses (B595-76 x Katahdin x S2782) (B595-76 x Awaba) (Navajo x Katahdin), (Redskin selfed x Yampa), (B2067-52 x Delus x S2782), and (Bungama x B595-76 x S2654).

From over 2,000 *second year seedlings* grown at the potato substation, 200 promising lines were selected. This maintained the 10 per cent selection rate established last season. Best selections were from the crosses (Onaway x Saco x S2782), (Navajo x Saco x Cherokee), (S2821 x B595-76 x Adina), plus selections from crosses involving Fundy, Bungama, Redskin selfed and Blanca.

Of the 445 *third year seedlings* grown at the substation, 140 lines were selected as worth further trial. Four lines derived from the natural pollination of S2782, four from the cross (Delus Kennebec), two from (Fundy x Exton), two from (Haig x S2782) and two from (S2855 x Kurrel) were outstanding.

In the *fourth year seedling* block, 49 lines were grown. Of these 14 were selected to be advanced to preliminary yield testing. Thirteen others were retained for further single row testing. Most promising were selections from (Kurrel x Merrimack), (Onaway x Adina), (B595-76 x S2865) and Kurrel selfed.

The preliminary yield trial at Red Range compared 29 different lines, each grown in four replications of 20 hills. Of these, 24 were selected for more advanced testing. Of the early types (Tawa x Adina), (B3095-18 x Adina) and (Onaway x S2856) were outstanding. Of the late maturing lines, selections from (Monak x 11-79 x S2865), (B3095-18 x S2856) and (Walanga x B2067-52) were best.

Breeding for Disease Resistance.—A number of advanced seedlings were screened by the Biology Branch for resistance to late blight. Highly resistant if not immune seedlings were derived from parents including 8350-4 from Scotland, Merrimack and Cherokee from U.S.A. and a locally developed line 76-26.

Further tests for resistance to common scab were conducted, by transplanting young seedlings into a blend of sterilised soil and scab inoculated vermiculite. As previously, inoculum was prepared simply by the maceration of peelings from heavily scab infested tubers. A total of 3,500 seedlings was tested by this method. Resistance came from U.S.A. varieties including Ontario, Menominee, Yampa, B595-76 and Redskin.

Central tableland field trials to test scab resistance of advanced seedlings were conducted, on a private property and at the new Orange Research Station. Several Departmental seedlings remained clear of scab compared to the susceptible Sebago. The latter was heavily scabbed. Resistant lines included S2897, a selection from the natural pollination of Redskin, S2902, a selection from (Delus x Redskin), and S2904—a selection from (B595-76 x S2782).

A Virus Y trial was conducted with the Biology Branch to determine the reactions of five advanced seedlings and the variety Norgleam to infection by aphid transmitted potato virus Y. Four of the seedlings showed a desirable, current season reaction. But the virus could not be detected in either Norgleam or the seedling S2897. Each will be re-tested.

Fertilizer Trials.—More trials were conducted in the series to compare different combinations of 0, 4, 8, 12 cwt superphosphate, 0, 1, 2, 3 cwt sulphate of ammonia and 0, 2 cwt sulphate of potash. In some areas the nitrogen rates were increased. In some areas the potash rates were varied. Due to the very adverse weather, many of these trials were abandoned—without worthwhile result.

Tendencies observed last year, for higher rates of nitrogen to be effective in the higher rainfall coastal highlands, were again noted; up to 6 cwt sulphate of ammonia was economic.

Such trials as were harvested showed again that it is difficult to get potash responses. Where responses are obtained, the sulphate salt seems better than the chloride.

Potato Variety Trials.—The number of trials was limited by available quantity of disease free seed of advanced seedlings and varieties. In northern tableland trials the early maturing seedling S2911, a selection from the cross (S2821 x Merrimack) produced very attractive tubers. The late maturing S2918, a selection from (B595-76 x 336-123), also did well. The red skinned S2897, a seedling from natural pollination of Redskin, again gave a good result.

In central tableland trials of the early maturing types, both S2901 (S2804 x Merrimack) and S2902 (Delus x Redskin) gave excellent results. They produced very attractive white skinned, slightly russetted tubers. In the late maturing trials, the variety Kurrel gave the best yield—about 9 tons/acre. Others that showed out well were S2885, a selection from Awaba x 336-123, and S2890—a selection from Sequoia x Cortland.

Potato "Elite" Seed.—The increase programme for elite seed of the Sebago, Exton, Bungama, Kurrel, Sequoia, Kennebec and Katahdin potatoes continued at Orange Research Station. All original lines of Bungama, Exton, Kurrel and Sequoia have been bulked. They have been shown to be quite pure and free of disease. The original lines of Kennebec have been maintained as such.

Selection of plants and tubers for a tuber indexing programme for each of the major varieties has started.

Potato Seed Certification.—Acreage of potatoes submitted for certification again declined. Compared with 1,310 acres submitted by 114 growers in the previous year, this year 800 acres submitted by 72 growers were finally certified favourably. Rejection this year was 3 per cent, compared with 16 per cent last season.

Potato Quality Tests.—Cooking tests were again done by the CSIRO Division of Food Preservation. Completed results are not yet available. Preliminary findings show that all varieties performed slightly better than average. None was outstandingly good or poor. Difference between Exton, Murru, Bungama and Kurrel was slight.

Specific gravity estimations were made for each seedling and variety at the Orange Research Station, using a potato hydrometer. Highest was the seedling S2893, a selection from the cross (66-10 x 11-79). This averaged 1,093. Excel (1.091), Fundy (1.087) and Kennebec (1.086) also showed up well. Sebago gave an average reading of 1.076.

Potato Introductions.—Orange Research Station has been declared a quarantine area. All introductions are now grown there in the second year of quarantine. This year six from the U.S.A. were grown. The best were Penobscot, Shoshoni, and La Rouge.

TOMATOES

Breeding Programmes.—These were at Hawkesbury Agricultural College and the Yanco Agricultural College and Research Station.

At Hawkesbury College: five fixed lines, twenty-eight segregating lines, ten introduced varieties and seventeen F1 hybrids were under observation. Three of the fixed lines showed enough to warrant commercial testing. Of the segregating material, selections from Step 286 x Anahu and (Kokomo x Rouge de Marmande) x Rouge de Marmande showed most promise. In testing the hybrids it was found that KY1 combined more effectively than Rouge de Marmande with Anahu. Also, Anahu and its hybrids were almost free from spotted wilt.

At Yanco: breeding dwarf varieties for processing was continued. Emphasis was on adaptability for mechanical harvesting. VF145 lines, Epoch, Libby C52 and Yanco Premium were the main parents.

Tomato Variety Trials.—Variety trials at Terranora Vegetable Station confirmed the disease resistance, high yield and superior quality of the three hybrids released in 1964. College Regal and College Cropwell showed high resistance to leaf mould (*Cladosporum fulvum*), under severe infection conditions.

In these Terranora trials, several fixed crossbreds developed at Hawkesbury College showed promise, especially in leaf mould resistance.

Release of Processing Varieties.—Two varieties developed at Yanco Station, Yanco Premium and Yanco Juicemaster, were named and released.

Yanco Premium was developed from a cross between Tatura Dwarf Globe and M3. It has similar characteristics to KY1, the present commercial variety; dwarf bush, excellent fruit cover, high yield. It is resistant to Fusarium wilt and skin cracking. It is suitable for pulp and sauce.

Yanco Juicemaster has an upright growth habit, dense foliage, and globular fruit. The excellent signal-red flesh makes it suitable for juice and for blending to improve quality. It, too, is resistant to Fusarium wilt.

Tomato Introduction.—At Hawkesbury College, Floralou and High Crimson, each from U.S.A. gave good results. At Yanco Station, VF 13-L from the University of California, U.S.A., was the outstanding introduction—most suitable for mechanical harvesting.

BEANS

Improvement Programmes.—Bean breeding at Hawkesbury Agricultural College was directed towards disease resistant string and stringless varieties. At Yanco Station the main object was stringless varieties, for processing and root rot resistance.

At Hawkesbury College: 252 lines were tested for anthracnose resistance, by inoculation in winter. They were grown for observation in the spring and the autumn. The most promising in advanced generations, for the green market, came from a cross between 124 x (Hawkesbury Wonder x Granda No. 23), Landreth Stringless x (Hawkesbury Wonder x Granda 23), Fullgreen x Brown Beauty, and NC-4 x Hawkesbury Wonder x Granda x WDR. For processing, (Hawkesbury Wonder x Granda) x Processor was outstanding.

At Yanco Station: yields of fixed lines of nine crosses between Blue Lake FM-1 and various stringless types were compared. Four of these lines were selected for naming and release, because of agronomic suitability and resistance to root rot. The root rot, thought due to a disease complex, has caused serious losses—even complete failures—in inland stringless bean crops grown for processing. Hence the resistance of the new varieties has great potential.

Four New Varieties Named.—The four varieties named (see previous paragraph) were: "Yanco" and "Leeton" from the cross (Seminole x FM-1) x Seminole; "Turon" from the cross Processor x FM-1; and "Bland" from Contender x FM-1.

More selections are being made within breeding lines developed from FM-1.

Manganese Trial on Beans.—The prevalence of manganese toxicity on old bean land was still apparent in commercial crops in the Tweed River district. A note on the tests being conducted is outlined in the report by Chemistry Branch, Division of Science Services.

Bean Seed Certification.—Grower interest of late has been confined to special varieties. Certification applications fell from a 51 acre total in 1963-64 to 29 acre total in 1964-65; 23 acres were certified, compared with 32 in the previous year. Production increased from 220 to 320 bushels.

PEAS

Pea Breeding.—At Hawkesbury Agricultural College: the two most promising selections came respectively from Early Wonder x Canner 72, and Alaska x Greenfeast. These lines are early and produce the small peas sought by processors.

Five fixed crossbreds selected in 1963 from Early Wonder x Canners 75 and Greenfeast x Early Wonder were field trialled in Tasmania in 1964. These early varieties were vigorous and high yielding. The peas were perhaps overlarge for processing.

At Yanco Station: two selections from Greenfeast x Early Dwarf and one from Greenfeast x Massey were compared with commercial varieties for yield. Because of excellent performance they were named and released. Three varieties (Yanco Early, Yanco Choice and Yanco Packwell) were also grown in trials in Tasmania. There, early maturity, high yield—and the uniform small pea of Yanco Choice and Yanco Packwell in particular—supported their potential for processing. Comparatively sparse foliage, and pea bearing on the top of an unbranched vine, indicated particular value if pod-picking should replace threshing the whole vine.

ROCKMELONS

Breeding for Disease Resistance.—Progress of breeding for combined, powdery mildew and Fusarium wilt resistance was again pleasing. Main source of powdery mildew resistance was found at the Yanco Station. This was in Oriental melons, although the fruit of this is quite uncommercial. Resistance to *Fusarium* was obtained also from Spartan Rock and Edisto.

Almost 4,000 seedlings were glasshouse-screened for disease resistance. From the F5 generations of the cross (36739 x PMR45) x PMR45, 13 selections were made, and three from the F6 generation of Hale's Best x Spartan Rock.

Twenty-seven breeding lines mainly in the F5 generation were grown in three selections in the Griffith district. One line showed Fusarium wilt. The others remained free of disease although adjacent commercial crops were attacked by powdery mildew and *Fusarium*.

A few plants of eight recently introduced varieties, including one hybrid, were screened for disease resistance. None showed combined resistance to the two diseases. Satecoy Hybrid from the U.S.A. showed resistance to powdery mildew but susceptibility to Fusarium wilt. Fusarium Resistant 75, a breeding line from the U.S.A. confirmed its resistance but was highly susceptible to powdery mildew.

ASPARAGUS

Gundagai Research Programme.—This programme, conducted in association with the Gundagai Asparagus Company, progressed substantially.

Trials with selective herbicides showed that diuron efficiently controls weeds in seedling asparagus and in established beds.

The *Fusarium* resistance of breeding material from the University of California was established. Seed increase was started.

A rotation trial has indicated that asparagus may be re-established much sooner after old bed eradication than the 10 to 12 years widely considered essential overseas.

CAPSICUMS

Improvement Programme.—Release of the yellow fruited capsicum College Gold has been followed by a minor programme to improve the fruit shape and agronomic features of the green varieties. This is at Hawkesbury Agricultural College. College Gold was used as a parent, to impart conical shape.

WATERMELONS

An Introduction from U.S.A.—Crimson Sweet, from the United States Department of Agriculture showed outstanding promise at the Yanco Station. It has pale green skin, a dark green stripe, and is transportable.

COMMITTEE RE IRRIGATION LAND FOR VEGETABLES

The Special Agronomist (Vegetables) was appointed to an Inter-Departmental Committee examining the matter of land allocations specifically for vegetable production in irrigation areas. The Water Conservation and Irrigation Commission and the Department of Agriculture are represented in the Committee. Matters under consideration include: desirable farm size; soil types; water needs, and tenure systems.

DIVISION OF HORTICULTURE

Research for the Fruit Industries

RESEARCH—CITRUS INDUSTRIES

Fruit Fly: Sterilization of Lemons, Mandarins and Grapefruit.—Investigations continued at the Citrus Wastage Research Laboratory, Gosford, under the direction of the Fruit Fly Commodity Treatment Committee. Ethylene dibromide uptake by these fruits having been shown as satisfactory, attention has been directed towards the rind injury problem. Results have shown that Emperor and Beauty of Glen Retreat mandarin varieties are not liable to rind injury from fumigation, and lemons are not injured substantially. However, investigations are continuing with Ellendale mandarins, and grapefruit.

Mould Wastage.—A survey of the level of the volatile fungistat, diphenyl, in wraps at time of use in packing houses, revealed substantial variations from bale to bale. Many contained the recommended 30 mgm per 100 sq. in or better, but some contained less. The survey was discontinued and attention directed towards confirming the optimum level of diphenyl for effective mould control.

Two of the new fungistats, the acetate and isobutyrate esters of ortho-phenylphenol, have shown particular promise when impregnated in wraps for mould wastage control. There appears to be no rind injury at concentrations up to 40 mgm per 100 sq. in wrap. Being almost odourless they could prove more suitable than the diphenyl now in commercial use. Confirmatory trials on the value of these materials are continuing.

Puffing and Creasing.—This condition comprises indentation lines appearing over breaks in the albedo of the rind. It is a widespread problem in oranges, causing rejections in fruit for export. At Yanco Agricultural College and Research Station nutrient limb injections and fruit shading were studied but do not indicate success.

Maturity Standards.—(*a*) Soluble solids, acid ratios and acidity levels have been studied in navel oranges, to find an improved chemical method of assessing palatability in fruit sent to market. Results reveal substantial variations. More work is needed. (*b*) Measurement of palatability as affected by rootstock, in export valencia oranges harvested early in the season is being studied at the Gosford Laboratory and the Yanco and Leeton Stations. Trees on trifoliata often produce fruit of good flavour and palatability early in the season although the acid content is still high. This fruit is classified "immature" by the straight acid test prescribed by the regulations, though fruit from trees on other stocks may pass but be less palatable.

Mandarin Thinning.—Emperor and some other mandarins are prone to overcrop, produce worthless small fruit, and develop a condition known as "scald" in which fruiting twigs die. Chemical, crop thinning possibilities have been tested in the past two seasons without success, using the hormone 2,4,5-T. Other materials are listed for trial.

Herbicides in Citrus.—Frequent cultivation, needed for control of weed growth, damages soil structure and interferes with tree roots. Dareton Station has been investigating weed control without cultivation and has shown the pre-emergent herbicide diuron to be efficient. Control has so far extended over six months without apparent harm to the trees. The treatment area will be increased to simulate commercial orchard conditions.

Pre-harvest Fruit Drop.—Hormone-type sprays such as 2,4-D and MCPA are used to reduce pre-harvest drop. A project has been started at Dareton Station to evaluate the materials and timing, and assess residual effects on tree health and fruit quality.

Lemon Rootstock Trials.—*Citrus macrophylla* as a rootstock for Lambert Eureka lemon is being evaluated in trials at the Narara, Dareton, and Yanco Stations, following favourable reports from California.

Leaf Analysis as a Guide to Citrus Nutrition.—Assessment of nutritional status in orange trees by analysing spring flush leaves has been started. This is in co-operation with Division of Science Services (Chemistry Branch). Thirty valencia orange groves in each of four districts, two coastal and two inland, were sampled. Data from the analyses are reviewed by a committee of Horticulture and Science Service officers, and manurial recommendations are prepared for each grower.

Sufficient background data to provide a sound foundation for fertilizer and soil corrective recommendations are being sought.

RESEARCH—STONE FRUIT INDUSTRIES

Variety Improvement.—Numerous canning and dessert peach varieties from interstate and overseas are at various stages of testing. Some are at full fruiting stage. Others are still in quarantine screening. New varieties of apricots, plums and cherries are also under observation. There are indications that some of the varieties are much superior to those grown by orchardists. Big improvements in handling and dessert or processing qualities are expected through this work.

Commercial plantings of new varieties are already being made, including two early dessert peaches, Starking Delicious and Redhaven from the U.S.A., two late maturing local peach selections, Glenalton and Fragar, and several new cherries, Ransom, Rival and Regina, which have outstanding quality. Their first fruits have commanded premium prices.

Breeding.—At the Yanco Station the breeding programmes for canning and dessert peaches and apricots are producing very promising material.

An apricot selection tentatively named Morocco continues to compare more than favourably with the standard canning variety Trevatt. One dessert and several canning peach seedling selections at an advanced stage of testing show good commercial prospects.

Two of the canning peaches, Wight and Windra, currently recommended for commercial planting were developed earlier by this Department.

Peach Rootstock Trial.—Following several years of stock multiplication, trees are now ready for field trial establishment at Bathurst Station. The object is to investigate the value of plum rootstocks for peaches, to overcome losses through wet conditions. The plum stocks being used are reputed to be fairly compatible with peach but this will be thoroughly studied.

Nutrition Trials with Prunes and Cherries.—Trials at Young continue to provide valuable information on nutrient needs. The results on prunes continue outstanding, despite current drought conditions. Complete fertilizers have shown a slight increase over purely nitrogenous applications on prunes.

Chemical Thinning.—Encouraging results in previous years from use of the chemical DNBP to thin plums on the coast and peaches at the Yanco Station, led to further trials in the past season.

On canning peaches DNBP again revealed positive thinning when applied at blossoming and stone hardening stage. Later application caused severe spray-burn on fruit, but high concentration was a factor.

On early plums DNBP at the blossoming stage failed to produce useful results, though earlier tests had shown it to be effective.

Irrigation Investigations.—At the Yanco Station, furrow irrigation research again showed that the most efficient application for Golden Queen, the main commercial canning peach grown on the M.I.A., is 3 inches of water at about 4-inch evaporation intervals.

Spray applications of water on hot dry summer days did not split either peach or apricot fruits. Orchard temperatures dropped several degrees during spray applications, whilst humidity increased. Results over four years have not shown that overhead spray application of water to peaches, apricots, and prunes cause adverse effects so far as pests, diseases and physiological conditions are concerned.

The spray irrigation investigations have particular importance because of development of new areas where only spray irrigation is possible.

Pruning.—Trials to evaluate various methods of pruning canning peaches in the Murrumbidgee Irrigation Area have revealed that a light, "long lateral" pruning system can prove more economic for Golden Queen peaches than either the heavy, orthodox pruning, or increased bearing area "Hanger" pruning. Pruning is so important in peach production that these results could be very valuable.

RESEARCH—GRAPE INDUSTRIES

Cropping of Doradillo.—An experiment commenced at Griffith in 1960 has shown that light pruning of Doradillo wine grapes increases yield and reduces year to year yield fluctuations. In years of light crops, lighter pruning gives significantly higher yields than severe pruning. In high crop years, severity of pruning does not influence yields, due to greater fruitfulness and heavier bunch weights of severely pruned vines. Yield of severely pruned vines (16 x 1 bud spurs) fluctuated by 42 lb between high and light crop years, while with lightly pruned vines the fluctuation was only 10 lb.

The experiment continues to demonstrate positive relationship between pruning weights and yields in the following season. This relationship may have application in crop prediction.

Thinning for Quality, in Purple Cornichon Table Grapes.—Chemical thinning of Purple Cornichon table grapes was studied after the previous season had shown that hand thinning of bunches greatly improved fruit quality. Spraying bunches at full blossom with N.A.A. reduced berry set, but too severely even at the lowest concentration used (5 p.p.m.). Further work is needed, at lower concentrations of N.A.A. However, gibberellic acid at 10 p.p.m., at shortly after full blossom, was effective.

Zinc Foliar Sprays and Fruit Set.—Contrary to the results of a year earlier, foliar sprays of zinc sulphate, and zinc sulphate and lime, each significantly increased berry set of Gordo Blanco wine grapes in a Griffith experiment. Best response was to zinc sulphate and lime when applied 2-3 days before full bloom. Zinc sulphate alone was good at three times of application, namely 2-3 days before full bloom, full bloom and at the shatter stage. Zinc sulphate without lime caused some leaf burn, but no harm to growth and fruit development.

Gibberellic Acid Sprays on Wine Grapes.—At Griffith, results of pre-bloom sprays of Gibberellic acid in loosening the bunches of Semillon wine grapes were striking. Because of tight bunches, fruit of this important variety is very susceptible to rain damage, near maturity. Best response was to a 5 p.p.m. spray applied four weeks after bud-burst. The treatment did not affect fruit quality or yields but greatly lengthened the bunch stalks, thereby giving loose bunches. Timing of application was found to be very critical and higher strengths applied one week later were less effective.

Variety Improvement.—Twenty-three new varieties of wine and table grapes were recently released from quarantine, after import from California. The new varieties will be planted at Griffith Viticultural Research Station during 1965. Eighteen varieties from Europe and various Australian districts have already been established at the Station. These are being propagated for variety trials. The first trial will be planted in 1966.

RESEARCH—POME FRUIT INDUSTRIES

Pear Rootstocks.—The pear rootstock trial planted at Bathurst Agricultural Research Station in 1939 has ended, but in the 1964-65 growing season some of the trees retained a good cover of healthy green leaves and bore large fruit while others alongside were defoliated by early February and carried little crop. This was found to be due to the D6 and PC4 (*Pyrus calleryana*) rootstocks' resistance to the extremes of very wet and very dry soil conditions experienced this season. This further supported the original recommendation of D6 as the best rootstock for Packham's Triumph.

Gibberellic Acid Effects on Pears.—At Bathurst Station full bloom applications of 25 p.p.m. and 50 p.p.m. of gibberellic acid increased the percentage of blossom clusters which carried fruit to maturity and the number of fruits per cluster. But the fruit from treated trees tended to elongated shape and, invariably, protruding calyx ends. Any advantage from increased set was lost through undesirable shape.

Cold Storage Fruit Fly Sterilization of Pears.—Cold Sterilization research, using apples and pears, continued at the Research Laboratory, Gosford, using procedures prompted by the U.S.A. Plant Quarantine authorities. Probit lines were established for exposure time—mortality relationships, for young and mature larvae of Queensland fruit fly in apples stored at 33 ± 1°F. These data indicated that 14 days at 33 ± 1°F might be suitable sterilization treatment. This is being tested; using pears artificially infested with fruit fly eggs and larvae, and also using pupae. To establish the validity of the treatment the U.S.A. authorities require 100,000 fruit flies to be killed, with no survivors.

Alternate Cropping of Apples—Use of T.I.B.A.—Some slight thinning effect was apparent when T.I.B.A. was applied to "on crop" Delicious 14 days from full bloom, at Bathurst Station. But the crop was still heavy and the fruit very small. The dry weather very adversely affected fruit size. Residual effects of T.I.B.A. on blossom initiation will be examined in the spring.

Growth Retardant in Apples.—A project was started at Nashdale to test the effects of a growth retardant on tree growth and fruit storage qualities of Granny Smith and Delicious apples. Growth measurements indicate up to 75 per cent reduction in shoot elongation. The storage trials are proceeding.

Apple Rootstocks.—At Yanco Station the trial of Granny Smith scion on 16 local and overseas rootstocks is progressing well but full cropping has yet to be attained. Tree size factors are emerging. These will later be correlated with cropping efficiency.

RESEARCH—TROPICAL FRUIT INDUSTRIES

Post-harvest Handling of Bananas.—These investigations are at the Tropical Fruit Research Station, Alstonville. They comprise:—

> *Mixed Ripe Problem*: Data obtained this year suggested that (i) half the variation in ripening times of individual fruits in a commercially mature bunch is due to fruit size; (ii) heat unit summations which can be related to fruit development may be important in establishing a maturity guide; (iii) "fullness" (angularity of fruit), the subjective commercial method of assessing cutting times, has some value because it relates to fruit age, fruit weight, and weight per unit length; (iv) within the range 65°–80°F, a rise in temperature halves the green life of harvested fruit. Changes in the leucoanthocyanin content of bananas are also being studied, in relation to the bunch emergence—harvest interval.
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> *Packaging*: A scoring scale for fruit injury has been developed. It is being used in transit simulation studies (impact and vibration sequence) to test packaging containers. Transit simulation produces fruit injury similar to that in rail transported fruit from northern New South Wales to Sydney.
>
> *Pre-cooling*: Preliminary studies have been made on the cooling efficiency of a batch-type hydrocooler, "chilling" symptoms in fruit exposed to low temperatures, maximum periods of exposure of bananas to 40°F temperatures before "chilling" occurs, respiration measurement methods, and control of stem end rots in single fruits.
>
> *Ripening*: Observations have been made on packaged and bunch fruit ripened with ethylene. During the ripening, ethylene concentration and temperature have been varied to observe the effect on ripening.

Banana Nutrition.—Data on the first cut from this trial at the Alstonville Station are being analysed. Results indicate beneficial effect of potash on leaf longevity. Nitrogen, phosphorus and potash individually appear not to have any effect on the various other factors being measured. Fertility gradients have shown up within the block and may have masked fertilizer response. Dry weather affected filling out of the fruit, especially in February-March, 1965. The dry seasonal conditions will affect, for the second cut, the plants' response to fertilizer.

Weed Control in Bananas.—The most promising of the herbicides under test at the Alstonville Station is diuron. This pre-emergent herbicide is not affecting bunch weight, although the total leaf production of parent plants may be reduced. The suckers are producing more leaves than average. Extended studies are needed, to confirm the effectiveness, to look for effects of continued applications, and to assess treatment economics.

Banana Irrigation and Water Relations.—An area of 4.2 acres for irrigation investigations was planted this year at Alstonville Station. Different sizes and types of planting material were studied. Spearpoints gave a 98 per cent strike compared with 90 per cent for bits. Early leaf length measurements showed longer leaf at two and five months of age from spearpoints than from bits. Larger spearpoints produced more leaf than did smaller or medium sized spearpoints.

Tensiometers, resistance blocks and thermistors have been placed in the block to study soil moisture relationships. Maximum-minimum aerial thermometers were placed to observe temperature gradients.

Banana Varieties.—The varieties established earlier in the isolation block at Wollongbar Station have been transferred to the variety block at Alstonville Station. Each plant has been described in detail and classified within a standardised classification system.

Pineapple Flower Induction.—In this trial at Alstonville Station, November inductions brought about the highest percentage of fruiting, with slightly poorer results from June induction. Only a quarter of July inducted plants fruited.

Fruit weights for the summer crop varied from ½ to 4½ lb, with near to 2 lb weight average. The dry weather could have caused this low yield. The winter crop is expected to have better quality.

Pineapple Selection Trial.—The ratoon crop of the previous year's plants at Alstonville Station did not mature for a summer crop. Most of the fruit harvested in summer 1965 was poor because of dry conditions. The fruit maturing was on small plants which took three years to produce a crop. The bulk of the ratoon selection crop is expected to mature in the coming spring.

RESEARCH—STRAWBERRY INDUSTRY

Strawberry Improvement.—The variety introduction programme continued and at least three American varieties tested for the first time showed outstanding qualities. These are Torrey, Shasta, and Cambridge Forerunner.

The more promising selections from the Department's own breeding programme were further tested. Some excellent types should be available for naming and release over the next few years.

As a result of variety trials it has been possible to issue reliable recommendations. Kendall, developed by this Department, and released in 1961, continues to prove outstanding for coastal areas. Most plantings now comprise this variety. Since Kendall was released the industry here has definitely revived.

Fruit Storage and Quality Investigations

In conjunction with the CSIRO Division of Food Preservation, work continued on the following projects:—

"Brown heart" in Williams Pears.—A paper has been published relative to the causes. Work is proceeding, to evolve satisfactory alternative means of reducing the cause, carbon dioxide, by using an absorbent. For export pears packed in polyethylene there is real danger that the temperature fluctuations during shipside handling could increase the carbon dioxide level and consequent fruit injury. In current work calcium hydroxide is being used for carbon dioxide absorption. The method appears promising.

Nutrition in Relation to Fruit Quality.—This has been a continuation of the original pilot trial. The object is to determine to what extent apple trees will absorb solid forms of N, P and K by means of direct injection. The method, if successful, would be used for quick evaluation of effects of different nutrients at various levels on quality and storage behaviour. The method holds promise but the maximum dosage without tree damage must be determined. When the N, P and K analyses on the fruit from last season's experiments have been completed, a decision on continuance or otherwise of this pilot project will be decided.

Superficial Scald Control by Chemical Inhibitors.—Ethoxyquin has been approved by Health authorities for use in this State. Limited quantities will be used this season in several districts. It is still not approved in the U.K. or European countries. Hence, it cannot yet be used for export fruit.

Polyethylene Storage of Apples and Pears.—Most of the pear crop stored at Orange and Batlow is now held in polyethylene bags; so too are some of the apples of one or two varieties. A limiting factor for apples is that scald-susceptible varieties and those susceptible to early breakdown can react badly to polyethylene storage. Use of ethoxyquin may prove satisfactory for varieties subject to scald. Further work in regard to breakdown is needed.

Controlled Atmosphere Storage.—Further work on this is likely to be in the form of advice on construction and operation of commercial stores.. Five small stores put into operation in the past year have not proved satisfactory and will need structural alterations.

Research Stations and Laboratories

Tropical Fruit Research Station, Alstonville.—Considerable development of irrigation supply has taken place. The contractors have commenced the storage reservoir, pumping station and rising main. The banana water relations and irrigation trial, covering 4.2 acres, has been launched.

Agricultural Research Station, Bathurst.—Land has been prepared and plans made to plant a peach stock trial; also a further small planting of commercial peach varieties, for short term trials and provision of fruit for marketing and presentation investigations.

Orchard drainage and packaging shed facilities have been further improved. A large waterway has been constructed, the packing shed has been lined, and a cool store has been installed. An irrigation system for supplementary watering of part of the orchard is being installed.

The Mist Propagation Unit was further improved, for better control and to ensure uniform sprinkler pressures. A unit was delivered for continuous recording of temperatures and performance.

Agricultural Research Station, Glen Innes.—Another strawberry variety trial has been established. The previous trial. comprising eight varieties, has yielded much information now used in the planting recommendations for highland areas. Seventeen strawberry varieties are now under test here.

Agricultural Research Station, Yanco.—Programmed reorganisation of stone fruit plantings has commenced. Old prune, apricot and peach trees no longer of value for research purposes have been uprooted.

Horticultural Research Station, Narara.—More new areas have been developed for strawberry testing. Specially treated planting material was raised this year for the various trials on growers' properties and at Departmental Stations. The Station also propagated a large range of citrus and peach varieties on various rootstocks, for use in Departmental stock and variety trials.

Citrus Wastage Research Laboratory, Gosford.—The Laboratory, operated co-operatively with the CSIRO Division of Food Preservation, continued the investigations on fruit fly sterilization treatments for citrus and pears, and on citrus preservation and storage.

Cool Storage Laboratories, North Ryde.—Cool storage investigations on fruit are conducted co-operatively with the CSIRO Division of Food Preservation at the North Ryde laboratories. Several cool rooms for use in controlled atmosphere storage have been reconstructed.

Committees Affecting Research

Co-ordination of Research in Fruit and Vegetable Processing.—The committee comprises representatives of the CSIRO Division of Food Preservation and this Department, with two representatives from the canning industry. It coordinates research on fruit and vegetable processing, reviews progress of current investigations, and plans future work. At the two meetings this year, breakdown of apricots, maturity testing and dipping of prunes, strawberry freezing, sulphuring of fruits, and citrus juice quality were under attention.

Deciduous Fruit Tree Improvement Committee.—The committee comprises officers of the Division of Horticulture and Division of Science Services. It aims to prevent spread of virus diseases, by selection of propagating material. Working in close co-operation with the N.S.W. Association of Nurserymen the committee has been able to ensure that most deciduous trees in N.S.W. are propagated from approved parent sources. Selection so far has been based mainly on visual freedom from virus diseases, but notably progress has been made in building up sources of proven disease-free material. A collection of virus indexing plants has been established. Testing of cherry varieties is proceeding.

Dried Fruits Processing Committee.—The committee comprises representatives of the CSIRO, the State Departments of Agriculture of South Australia, Victoria and N.S.W., and the Department of Primary Industry. Meetings are annual. This committee since 1929 has valuably assisted Australia's dried fruits industry. Under attention this year were preparation of matter for the publication of Extension bulletins on drying vine and tree fruits, dipping and sun drying of sultanas, composition of dipping oils, and white centres in dried apricots.

Advisory Committee on Fruit Cool Storage Investigations in N.S.W.—This committee met to consider the results and projected programmes of investigations on fruit cool storage being carried out by the University of Sydney, C.S.I.R.O. Division of Food Preservation, and this Department.

Citrus Wastage Research Committee.—This committee programmes and directs investigations into post-harvest wastage problems. It operates as a sub-committee of the Advisory Committee on Fruit Cool Storage Investigations in N.S.W. The CSIRO Division of Food Preservation is represented. The committee met twice this year.

Fruit Fly Commodity Treatment Committee.—This comprises representatives of the Department of Primary Industry, the CSIRO, the State Departments of Agriculture in Victoria, South Australia and N.S.W., and the Queensland Department of Primary Industries. It met once this year. It directs investigations into sterilization of lemons, mandarins, grapefruit and pome fruits for fruit fly.

Banana Research Advisory Committee.—This reviews progress on banana post-harvest investigations and recommends allocation of funds contributed by the Australian Banana Growers' Council and the Commonwealth Government. The CSIRO and the States of Queensland and N.S.W. are represented in the Committee. It met twice this year.

CSIRO Vine Improvement Research Committee.—The CSIRO Horticultural Research Section has recently formed a Vine Improvement Research Committee. This includes representatives from State Departments of Agriculture, the Australian Wine Research Institute, the Federal Grapegrowers Council and the Australian Dried Fruits Association. The first meeting will be held shortly and the functions will be clarified. The Committee's primary role is understood to be advice to the CSIRO, relative to grape research programmes. Co-ordination of viticultural research within Australia may also be attempted.

N.S.W. Citrus Juice Quality Investigation Committee.—The CSIRO, the M.I.A. Irrigation Research and Extension Committee, the N.S.W. Citrus Growers Council and this Department are represented in this. The objects are to determine the effects of scion selection, rootstock, and location on juice quality and, in particular, on juice bitterness. Work with navels and valencias from stock and variety trials on Departmental Research Stations at Narara and Yanco suggested that differences due to scion strain and rootstock might be more important than location.

Citrus Improvement Committee.—This is an intra-Departmental committee. It is concerned with influence of virus diseases on tree health, rootstock performance and scion-rootstock relationship. Three meetings were held this year; to receive project reports, review projects and prepare the investigational programme. The possibility of Etrog citron as an indicator plant for detection of Scaly Butt virus on symptomless trees was advanced when positive symptoms appeared after four months in some cases. However, absence of symptoms in some instances has indicated a need for further work before full acceptance of the method.

The commercial possibilities of "dwarfing" in association with close planting, the transmission of "dwarfing" by inoculation, and the protection of grapefruit from severe Stem Pit by mild strain infection, continue as specially important projects.

Apple and Pear Spray Residue Committee.—This committee is representative of the Department of Primary Industry, the CSIRO and the Victorian, Tasmanian and N.S.W. Departments of Agriculture. Its primary problem is to ensure that all export apples and pears meet the changing residue requirements of importing countries. To this end it is required to know what the residue levels are, keep residues to a minimum consistent with horticultural usage, and develop post-harvest residue removal methods.

Extension Services to Fruit Industries

General.—Demand for advice continued heavy in all districts. All extension media were employed: prominently farm visits, field days, schools, press, radio and television. Three rural television stations have co-operated. Much use was made of this medium for special, topical subjects. Industry organisations co-operated in production and circulation of regional Pest and Disease Spray Calendars.

All district fruit officers and fruit inspectors were brought to Sydney at convenient times, for first hand experience of fruit and other commodity marketing conditions and procedures. This programmed in-service development of staff has provided a better appreciation of marketing problems generally, and more effective liaison between officers and growers in their approach to remedial measures.

Extension Committees.—Close association was maintained with the Irrigation Research and Extension Committee for the Murrumbidgee Irrigation Areas. Officers participated in the full committee and various sub-committees.

A committee with similar functions was formed for the Central Coast, with headquarters at Gosford. It is called the Central Coast Agricultural Research and Extension Committee.

This Division enjoyed high standard, industry co-operation in all districts—including practical and financial support in difficult situations.

Symposia for Fruitgrowers.—A two days symposium on "Cool Storage" held at Orange was well attended by N.S.W., Queensland, Victoria and Tasmanian growers and cool store operators.

"Fertilizer Usage" was also subject of a two days symposium at Orange, with 150 growers present.

Fruit Packing Training.—The fruit packing instructor in co-operation with District officers organised and conducted special Packing Classes, and field demonstrations in grading and packing of fresh fruits. Packing Classes were held at five major fruit growing centres with attendances as follows:—Bilpin, 58 students; Orange, 36 students; Batlow, 29 students; Coffs Harbour, 20 students and Camden, 61 students; *total*—204.

Twenty-four well attended demonstrations for organised groups of fruitgrowers were held, throughout the fruit areas.

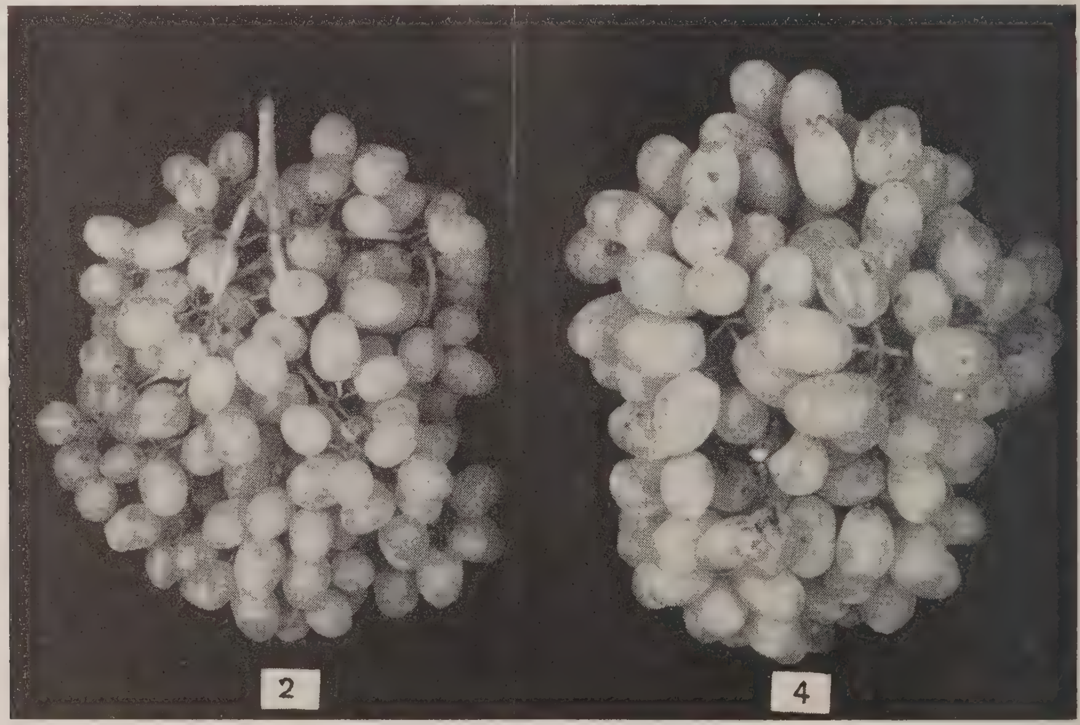
Charts for the major fruits were produced as grading and packing guides.

Tape recordings on containers, packing and other matters affecting marketing were made by the packing instructor for distribution to Regional centres, for radio use; also press statements.

These combined efforts produced results that relieved local shortages of packing labour, as well as improving methods and attitudes to fruit handling for market presentation.

Pruning Demonstrations.—Considerable attention was paid to this aspect of stone fruit growing. Pruning demonstrations were in most districts. Better pruning methods for prunes. and advice on training of young stone fruit trees of all types received special attention. Improved and earlier cropping and a general lift of fruit quality have resulted.

Citrus Post-harvest Attention.—Recommended practices in washing, waxing, and packing of oranges to enhance appearance and extend shelf life have been campaigned through demonstrations and lectures. Many processing plants have been installed by private growers this year, and extension officers demonstrated and advised on operation.



Bigger Sultanas by Gibberellic Acid Treatment

Sultanas, being seedless, have become a popular table grape. Berry smallness has been a shortcoming. More than 50 per cent increase in size has been demonstrated through a single Gibberellic acid spray treatment. There will be wide use of this by commercial growers next season.

Viticultural Research Field Day, Griffith.—At the first, full-scale field day at Griffith Viticultural Research Station since the start of the Station's rehabilitation in 1960, growers and winemakers were impressed by the progress. They were specially interested in the research projects; particularly the variety improvement work on wine grapes, irrigation and tile drainage research, and use of hormone sprays on wine grapes.

Sultana Table Grapes, Quality Improvement Campaign.—Methods towards outstanding improvement in quality of sultana grapes sold as fresh fruit, using gibberellic acid sprays and bunch thinning, were demonstrated in the Lower Murray district. Sultanas are one of the few seedless varieties and have greatly gained popularity as a table grape in recent years. The serious quality fault of the variety is small berry size. The demonstrations have shown that berry size may be increased by more than 50 per cent with single spray application of the growth promoter gibberellic acid. Wide use of this treatment by commercial growers next season is expected.

Vine Mite Control Demonstrations.—These were conducted throughout the State. They compared lime sulphur with a number of new miticides. Vine mites have become a major pest in recent years. None of the new miticides proved better than, and all but one were decidedly inferior to lime sulphur—the standard recommendation for many years past. Ethion-in-oil (1 in 80) was as effective against bunch mite and possibly blister mite. Failure to control this pest, in some vineyards, throughout the State, has been due to inefficient application of the lime sulphur.

Fruit Industry Trends

POME FRUIT INDUSTRY TRENDS

Production.—Early estimates for the 1964-65 apple crop had indicated a record production, exceeding 3,000,000 bushels. The pear crop, because of unfavourable setting conditions, was expected to be down considerably on the previous two or three years figures.

Had normal conditions prevailed the apple estimate would have been reached and perhaps exceeded. But extremely dry weather prevailed. In all except the two irrigated areas of the Murrumbidgee Irrigation Area, and Forbes, the crop and fruit size were very adversely affected. The result fell far short of the estimate.

Seasonal Conditions.—Most districts experienced the driest year since 1947. For some this was the driest summer and autumn period on record. In the highland districts, Batlow and Orange, spring rainfall was abnormally high. This ceased about November. From then on, little or no useful rain fell during the growing and harvesting seasons. Coastal and near-coastal districts have had little rain of consequence since June, 1964. Also, at Oakdale, Tallong, Wingello and Penrose there were disastrous bush fires in March and many orchards were totally or in part destroyed.

Immediate effect of the abnormally dry spell was drastic reduction of what had promised to be a record crop. Many thousands of bushels of fruit in all districts remained too small to market. The proportion marketed was affected in quality, especially from the cool storage viewpoint.

Further effect will be apparent next season in reduced crop, due to reduced tree vitality. Luckily for pear growers, pears, unlike the apples, this past season set only a relatively light crop. In general they were not so affected by this adverse season as were apple trees.

Plantings.—The total area under apples and pears has increased by just on 500 acres this year, to 22,857 acres. Of the total, 7,625 acres are young trees not yet bearing or only in early bearing. Since more than a third of the total comprises more or less non-bearing young trees, production should increase rapidly during the next decade, irrespective of any future planting. The ratio of young trees to bearing trees is far more than is needed to maintain adequate production in face of normal wastage in older plantings.

In highland districts the plantings have been mainly Red Delicious strains and the late storage varieties Crofton and Bonser. Rate of new plantings has eased down and, in view of the past dry season, considerable increase in acreage this winter is not expected.

"Hedgerow" system close planting, with trees on Northery Spy or similar types of rootstocks, continues to gain ground. This is particularly so in the bigger districts. Several nurserymen have established stool beds of such stocks.

Prices and Markets.—Prices for large and medium sized apples and pears have been very good throughout the season. This has tended to offset the drought effects. But there has been great oversupply of small sizes on the markets. These have realised only comparatively low returns. In many cases the returns barely paid marketing cost. In many instances the fruit remained too small to be marketable. Some of this fruit was disposed of to processors for juice and pulp. The remainder was waste or used for stock feed.

There is real likelihood of recession in general prices as the season progresses, because of the proportion of poor quality fruit coming from cool stores.

Export.—Early estimates for a record crop throughout the State led the newly established New South Wales Export Forecasting Advisory Committee (Apples and Pears) to forecast that well over 200,000 cases of apples would be available for shipment. If conditions had remained reasonably normal this figure would have been easily attained and perhaps exceeded, because of growers' increased interest in exporting the crop. In light of the weather that developed all calculations were upset. The final figures, totalling 182,000 cases to all destinations, are well below those of several recent years. Of the total exported, about 130,000 were to the United Kingdom and continental destinations. The fruit has been well received overseas, on the whole, and realised good prices. Adverse comment from overseas concerned net weight of fruit from some packers, and this will receive more attention next season.

Irrigated districts of the Murrumbidgee Irrigation Area and Forbes supplied well over half of the total exports.

Processing.—With present and prospective production increases in mind it is fortunate that pome fruit growers in recent years have been taking keener interest in outlets other than the fresh fruit markets. With increased production there is little prospect of lower grade fruit realising payable market prices, owing to presentation costs. If it can be channelled into any acceptable processed form, juiced or canned, so much the better. The Batlow cannery has always processed a notable part of that district's crop. Now several other of the more important canneries are processing apples, as pulp and juice. The huge quantities of unsaleable small apples available this season owing to the dry weather, have increased the processed proportion greatly, but actual figures are not yet available.

Cool Storage.—A just completed census of cool storage facilities has shown that New South Wales can accommodate 2,300,000 cases; almost one-third of the total estimated annual apple and pear crop. By far the greatest proportion of the cool stores is in the main pome districts; Orange, Batlow and New England; as co-operative or private grower stores. Most of these have been built within the past fifteen years. In Orange district there are eighty-nine grower stores. These, plus the local co-operative (O.P.R.) stores, provide for 1,300,000 cases; about equal to the district's total production in a normal year.

The greatly expanded production in New South Wales over the past ten years would have led inevitably to a serious glut each year, unless storage capacity had increased as it has. However, the phenomenal growth of grower-cool storage has made obvious the increasing need of more extension advice on this phase of orchard operation. Technical operation of the stores is relatively simple, but most of the troubles that currently beset cool stored fruit have their origin in the pre-storage growing period. Cool store operators must have a good knowledge of the possible effects of the various seasonal and cultural phases on storage.

From the Cool Store Symposium this year there was a unanimous resolution requesting appointment of a field officer specialist in cool storage advice.

STONE FRUIT INDUSTRY TRENDS

Production.—Crops generally were heavy and exceptionally high quality, except that prune yields in the Young district were adversely affected by drought and dessert fruit cropping was reduced due to severe spring frosts in tableland districts. Cherry crops were the largest and best for several years. Coastal peach, apricot and plum crops were of outstanding quality. Excellent canning apricot and peach crops were produced by the Murrumbidgee Irrigation Area. There was almost complete absence of losses through brown rot and other rots this season.

Plantings.—Significant increases in dessert peach production are expected over the next few years in Bathurst district. Forty per cent of all plantings there are under seven years, and 20 per cent under four years. Production of canning peaches are also expected to increase in the districts concerned, as more young plantings come into bearing. However peach plantings in general have remained fairly static over the past year.

Plum plantings have increased. The excellent returns over the past few years for these fruits have led to this. Increased quantities of Japanese types, and general improvement in market quality, particularly in terms of maturity standard, have contributed to consumer-popularity of plums.

Total area under cherries of Young now exceeds 3,000 acres, with about half non-bearing. Production over the past ten years has increased from 75,000 to last year's record of 407,000 x ¼ bushel cases. This yield will greatly increase. Interest in further cherry plantings continues at Young. This year's plantings were severely restricted by drought conditions.

Cherries for Processing.—Demand for cherries for processing has notably increased. About 200 tons of white cherries was supplied last season from Young district to processors in New South Wales and Victoria. At Orange a record quantity of 420 tons of white cherries was brined, and prices to the grower have increased. Demand for processed cherries in Australia has improved, and brining of fruits seems likely to increase.

Increased Use of Cold Stores.—Use of cold stores for the pre-cooling of stone fruits continued to increase. In Young district, stores are being built to pre-cool cherries. Existing stores are being used in most other districts. The trend should lead to improved market quality of stone fruits.

Mechanical Harvesting.—There is a move towards use of mechanical aids in harvesting prunes. In Young district, and the Murrumbidgee Irrigation Area, catching frames have been used, with mechanical tree shakers. This trend will continue and develop into the widespread use, as will bulk bins for transport.

Bulk Handling of Stone Fruits.—Interest in bulk handling of stone fruits, particularly peaches, apricots and prunes, has increased.

The J. H. Hale dessert peach was successfully handled in bulk bins on a commercial scale this season for the first time. They were handled in just as forward a condition as is the custom in bushel cases. Canning peaches and apricots have been handled in bulk bins over the past two seasons but adoption of this method is not yet widespread. It is certain that the bulk handling of stone fruits will continue to increase, with consequent savings in costs.

STRAWBERRY INDUSTRY TRENDS

Strawberry plantings have again increased in many areas. This trend has been fostered by release of improved varieties by this Department. Plantings are expected to increase, as demand for strawberries becomes stronger.

CITRUS INDUSTRY TRENDS

Production.—Production is steadily increasing. Trees planted in the past six years are entering production, and the slightly older trees are approaching full production.

Plantings.—Decline in area planted to citrus has been apparent in coastal districts where urban spread has had an effect. This has been largely offset by increases elsewhere, but the rate of new planting has slowed.

Price Levels.—Low price levels have ruled throughout the year. This delayed harvesting, particularly of Valencia oranges. These will hang on the trees indefinitely. Last season's fruit was still going forward as late as June, 1965. Fruit losses were considerably reduced by the large quantity required for juice purposes.

Citrus Juicing.—Increasing quantities of the Valencia orange crop have been diverted to processors for juicing. Frozen-concentrate activity has remained high but big development in fresh juice processing has occurred in coastal areas. The juice is extracted, retreated, cooled, at Gosford, and delivered by road tanker to a milk distributing company at Parramatta. Packaged as half and one pint cartons and gallon jars, it is delivered to homes, shops, clubs, etc.

This outlet, originally requiring only 500 tons of oranges annually, consumed 4,000 tons in the past year. Further expansion appears certain.

Export Conditions Amended.—For the past two seasons oranges that had been "picked", as opposed to "clipped", mould-sterilized by immersion in sodium ortho-phenylphenate (SOPP) solution, and wrapped in diphenyl impregnated wraps, had been successful exported to "Near East" destinations. The Department of Primary Industry has now amended the Export Regulations to allow the export of "picked" oranges to all destinations other than New Zealand, Europe (including U.K.), and Canada.

The value of ethylene dibromide (EDB) fumigation of oranges as a fruit fly disinfestation treatment was demonstrated when 68,000 bushels was exported from the M.I.A. to countries that impose a 12 months ban on localities within 50 miles of a fruit fly occurence. The occurrence affecting the 68,000 bushels from the M.I.A. was in a backyard at Narrandera. This 12 months ban has since been lifted, as the required period has elapsed since the last occurrence.

Orange Marketing Board.—A poll, conducted this year on the question of forming an Orange Marketing Board, resolved in the negative. Central Coast supporters of the proposal have since then had the formation of some other marketing organisation under consideration.

VITICULTURAL INDUSTRY TRENDS

Wine and Wine Grapes

Production.—Wine grape production in New South Wales for the 1965 vintage is estimated at a record 42,000 tons, compared with the previous record of 39,080 tons in 1964. Excellent conditions prevailed in the M.I.A. apart from a wet early spring which favoured black spot and dead arm disease. Production in the M.I.A. reached a record 36,202 tons compared with 33,024 tons in 1963-64.

Introductions of wine grapes from Murray districts into the M.I.A. for processing again declined. The fall was from 982 tons in 1964 to 480 tons in 1965. The only variety introduced was Gordo Blanco.

In the Hunter Valley a big crop was harvested despite the drought late in the season. There were good spring rains. Generally, the wine grapes were unaffected by the drought. It is estimated that 1,600 tons were produced in the district this year compared with 1,167 tons in 1964. The quality of 1964 Hunter wines is excellent.

New South Wales Wine Production.—Total wine production for New South Wales for the 1965 vintage is estimated at 6,500,000 gallons, compared with 6,030,499 gallons in 1964.

Plantings.—Most of the expanded New South Wales acreage for grapes is due to a high planting rate of wine grapes over the last few years. This has been encouraged by a succession of excellent seasons, high yields, and good prices. Since 1963 there has been little variation in the non-bearing area of wine grapes. It now stands at 18.7 per cent of the total. Allowing for removal of old plantings, an expansion average of 330 acres per annum is apparent.

Greatest increase in plantings has taken place in the M.I.A. Since 1961 the area there has jumped by 1,000 acres, to 5,367 acres in 1964. Assuming yields of 7 tons per acre the vintage will increase by 2,000 tons per annum if the present expansion rate continues. This would result in surpluses, as wineries are operating at near maximum capacity.

The only varieties recommended for planting in the M.I.A. this year were Gordo Blanco and Black Shiraz.

In the Hunter Valley since 1963 there has been an increase of only 25 acres, to 1,204 acres in 1964, despite a fairly high non-bearing area—15.5 per cent of the total. Many old uneconomic plantings are being pulled out. So the acreage has not increased as much as expected.

There has been little change in the position at Corowa and Barooga. There, 702 acres of wine grapes are grown. But in the Lower Murray district the area of true wine varieties is expanding. After all plantings there are bearing this district will soon contribute near to 3,000 tons of the State's wine production.

High M.I.A. Yields.—Combined effect of improved cultural practices and tile drainage has markedly increased wine grape production per acre in the M.I.A. In 1965 the yield average of most of the main varieties exceeded 8 tons per acre. The highest yield was obtained from Semillon. It yielded a per acre average of 9.4 per tons. The figures contrast favourably to the yield average of 4.2 tons per acre 10 years ago.

TABLE GRAPES

Production.—Table grape production in New South Wales for 1964-65 should reach a record figure of 7,500 tons, compared with 7,012 tons in 1963-64. Seasonal conditions for table grapes were excellent and the harvest season was extended much beyond normal length. Also, the quantity of sultanas diverted to the fresh fruit market continued to increase.

In the M.I.A., 305,688 half-bushel cases of table grapes were marketed compared with 344,517 half-bushel cases in 1963-64. Fruit quality was excellent and prices were satisfactory throughout.

Notably, table grape production in New South Wales has increased by about 500 tons per annum for the last six years.

Plantings.—The table grape area in New South Wales is steadily increasing. Since 1963 there has been an overall gain of 50 acres. The non-bearing area of table grapes is 12.5 per cent of the total. Black Muscat is still the most important variety, but its area in the early districts near Sydney is notably declining due to urban development.

Grape Exports.—Improved shipping and air freight facilities have led to steady expansion of grape exports to the near Pacific Islands. To foster this trade the Export Regulations have been eased, on a trial basis, to permit export of more varieties. Results of the trial shipment will be reviewed before next season, to determine whether permanent variation of requirements for grape exports to the near Pacific Islands is justified.

DRYING GRAPES

Production.—Production of dried vine fruits in New South Wales for the 1964-65 season was very high. It should equal or better the record crop in 1963-64. This was 14,313 tons (dry weight). Spring weather was unsettled but gave way to excellent harvest conditions. Fruit quality was outstandingly good.

Plantings.—The non-bearing area of drying grapes is only 4.2 per cent of the total; not enough to maintain the existing area. Since 1963 the area of sultanas, the State's most important variety, fell by almost 100 acres to 6,642 acres in 1964. Interest in planting drying grapes is likely to be stimulated by a big lift in export prices over the last two years, plus adoption of a stabilization plan by the industry.

Export Prices.—Export prices in 1964 and 1965 continued upwards. By the end of March, 1965, 90 per cent of the previous season's record sultana crop had been sold at a price average of £138 16s. 8d. stg per ton in the United Kingdom. This compares with a price average of £133 13s. 4d. stg. per ton for the 1963 crop. The return for the 1962 crop per ton was 30 per cent lower than this.

Drying Grapes Experimental Area, Dareton.—The Department's first experimental planting of drying grapes has been made at the Horticultural Research Station, Dareton, with the establishment of three acres of sultanas under spray irrigation. The experiment is designed to test the productivity of six high-yielding selections of sultana grapes and at the same time allow superimposed short-term experiments.

TROPICAL FRUITS INDUSTRY TRENDS

Acreage and Production.—Banana acreage has declined from 26,319 acres in 1963-64 to 24,775 in 1964-65. Production also fell, by about 0.5 million bushels, to about 4,000,000 bushels for the year. Over the last seven years, acreage has gradually declined from 29,659 in 1958-59 to the present 24,775 acres. In the same period, total production has been maintained around the 4 million bushel mark. Increased per acre production has been mainly due to a run of good seasons, supplemented by better cultural methods. Unless plantings increase, adverse seasons could lead to shortage of fruit for market.

Export.—Two consignments of bananas, totalling 35,000 bushels, were exported to New Zealand. The Banana Growers Federation initiated this. This first export of bananas from Australia proved quite successful. Departmental officers helped by advising growers of the type of fruit required for the export trade, and inspected all consignments before acceptance for export. The fruit arrived in good condition and further export can be expected.

Packing.—Use of cartons for banana marketing is now accepted practice. The cartons have led to packing in hands and an increased consumer demand for this type of presentation. Two packing houses have been established and a number of growers have accepted the practice. Establishment of other community packing houses of the sort is expected.

Regulatory Services

DISTRICT AND SUBURBAN INSPECTIONS

Citrus Gall Wasp Inspections.—Systematic inspections of the nurseries and re-sellers that distribute citrus trees continued, throughout the Counties of Cumberland and Northumberland, whilst inspectors in other areas maintained efforts to detect and destroy. Except in Newcastle and Toronto areas the position appears better than last year, but this could be a seasonal reflection. Respite would not be warranted.

Because of the difficulty of control of this pest, Division of Science Services will further study nursery tree treatments, pot insecticides and field behaviour in a commercial orchard at Oxford Falls.

Potato Inspections.—Inspection of potatoes continued to engage a big part of the regulatory services. Particular accent this year was on implementation of the decision to enforce prohibition of interstate introductions in second-hand sacks. Counsel was engaged to represent the Department in successful prosecution of one of the leading produce agents for breach of the Proclamation. This case established the authority of the State to prohibit introduction of potatoes in second-hand sacks. Imposition of a substantial penalty served its purpose.

The Potato Grading Regulations were amended in January, 1965. It is of interest that the Senior Inspector's report refers to inspection of 1,330,539 bags of potatoes forwarded to Sydney markets, and that 34,246 bags had to be rebranded in accordance with the amended regulations and 19,454 bags either regraded or rebagged.

Grape Inspections.—Following the more rigid inspection of grapes offered for sale on the City Markets in 1963-64, and rejection of 14,440 of 32,656 cases of fruit because of their immaturity, action was taken to amend the Maturity Regulations. The aim is to get more uniformity between adjoining States.

Increased extension, field tests, close co-operation with the Queensland Department of Primary Industries and the support of the Industry as a whole have reduced the percentage of grape rejections because of immaturity. For Queensland alone, the rejections fell from 2,526 cases in 1963-64 to 492 cases in 1964-65.

Whereas follow-up action was not possible in 1963-64, and there is no doubt that most of the fruit rejected was sold illegally, Ministerial action to seize and destroy immature grapes in 1964-65 had the desired effect.

Implementation of Section 9, Plant Diseases Act, 1924-62. —Difficulty in conducting prosecution of growers consigning fruits and vegetables to the City Markets from interstate, and some persons' disregard for formal warnings, led to Ministerial action. This was taken in accord with Section 9 of the Plant Diseases Act. Two consignments of pears from Victoria were seized and distributed to charitable institutions, and considerable tonnages of potatoes and pumpkins were reconsigned to the State of origin.

Prosecutions and Warnings.—Two hundred and eight formal warnings were addressed to persons alleged to have committed breaches of Regulations gazetted under the Plant Diseases Act, and 38 prosecutions were initiated. A feature of these prosecutions is that Magistrates, while requiring more positive evidence to establish ownership (particularly in the ex parte cases) are imposing much heavier penalties.

Following review of regulatory boundaries and more equitable distribution of responsibilities, more attention has been directed toward destruction of habitually neglected fruit trees. Pressure on owners of these premises is intended.

Staff Training.—A second In-Service Training School for Inspectors, Plant Diseases Act, was conducted at the W.E.A. Hostel, Newport, in August, 1964. A third school will provide for new appointees and officers unable to attend either of the two 1964 schools.

Staff increases at the Export and Import Branch during 1964-65 enabled disposition of inspectors according to field of duty. Regular training classes will be introduced to ensure that the officers concerned are thoroughly trained in the duty concerned. Also, interchange of officers will enable all officers to acquire groundwork in the different dispositions. But present exigencies dictate concentration of effort until most officers are properly trained in at least one field.

Review of Regulatory Establishment.—Review of the Division of Horticulture's Regulatory Establishment is nearing completion.

Some local re-arrangements have been made, to provide for the most efficient and economic deployment of Inspectors, Plant Diseases Act. The main country variations were creation of a new Inspectorate at Barham, termination of Wiseman's Ferry Inspectorate, transfer of Camden headquarters to Campbelltown, and proposed transfer of the Batlow Inspector to Wagga.

The Barham Inspectorate, also the one located at Finley late in 1963, and the two previously established at Albury and Dareton, have been strategically placed to service the Murray Valley as a whole and promote the export of N.S.W. citrus by trying to maintain the status-quo of the Murray Valley and M.I.A. with respect to freedom from fruit fly.

Action has also been taken to increase the Inspector staff of the Export and Import Branch, by providing a Mascot Quarantine Service from 6 a.m. to 10 p.m. and appointing ten more officers for inspections at the City Markets, fruit shops, barrows and roadside stalls throughout the Metropolitan area.

Metropolitan Inspectorates are now being examined in detail, towards co-ordination of all three services.

Office Accommodation at the City Markets.—To assist regular and intense inspection of fruit and vegetables at the City Markets, the Public Service Board has approved rental of additional office accommodation from the New South Wales Chamber of Fruit and Vegetable Industries. Inspectors, Plant Diseases Act, will occupy two rooms at the Chamber's premises. As an operational base these offices have already improved the efficiency in testing maturity of grapes and citrus. Proximity to the N.S.W. Chamber of Fruit and Vegetable Industries has also encouraged discussion of industry matters. This will be to the mutual advantage of each and the industry as a whole.

Fruit Fly Control.—Control of Queensland fruit fly in country towns by organised and systematic whole-town treatment continued to demonstrate successfully the efficiency of recommended treatments. Success of the scheme in the M.I.A. has been followed by lifting of quarantine conditions involving commodity treatment of fruit intended for export interstate and to New Zealand. This has removed an additional marketing cost, of great dimension when related to 68,000 bushels of export oranges fumigated last season.

Narrandera and Leeton have now been free from infestation since 1960. Broken Hill and Menindee have been free of it for two years. Other treated towns where infestation was not recorded this year include Hillston, Corowa, Cobar, Griffith, Nyngan, Condobolin and Quirindi.

Towns under initial treatment include Dubbo, Forbes, Parkes, Wellington, Richmond, Boggabri, Bourke and Narromine. They have recorded reduction from epidemic to only light infestations.

The scheme has been practical, economical and successful. Thus there has been great public appreciation and support in the towns. Shire and Municipal Council and industry organisation co-operation has been most effective in the projects.

The scheme is destined to expand through other Councils. Ways and means of coping with the increases, beyond the present Divisional resources, have now to be solved.

Border Inspections.—At the inspection point maintained jointly with the Victorian Department of Agriculture, 285,370 vehicles going to Victoria and the Lower Murray areas of N.S.W. were inspected and 19,645 items of fruit were intercepted. Seven instances of fruit fly were detected. Total cost for the year was £16,602. This Department pays half.

M.I.A. Quarantine.—Quarantine regulations under the Irrigation Act and Plant Diseases Act were policed. Two hundred tons of wine grapes were allowed in from the Murray River areas for wine making, and 200 tons of grapefruit from the same source for processing.

Amended Proclamations and Regulations, Plant Diseases Act.—Amendments were gazetted concerned with apple and pear grading, potato grading, banana grading, papaw grading and grape grading Regulations. Additional conditions were gazetted for Proclamations dealing with grape vines, fruit fly (2), importation of fruit from Western Australia and South Australia, and the Dried Fruits Act.

Miscellaneous.—Conditions governing use of second-hand containers to bring fruit and produce into N.S.W. were enforced following similar action by Queensland. Enforcement of these conditions was difficult and it became necessary to allow time for re-adjustment by the trade.

At the request of a Conference of State Horticulturists, the Division of Horticulture produced a summary of approved fruit containers for all States. The data provided a basis for decisions to delete certain redundant containers and approve a generally uniform list of containers for all States.

With the advent of fibreboard as an alternative to wood in making fruit containers, the Sydney Market has been used extensively for trials of a large range of containers for various fruits, both intra- and inter-state.

Incidence of fruit fly in bananas was a matter for concern. It led to rigid rail head inspection of all fruit and, particularly, interception of sprung fruit intended for interstate trade. Both Western Australia and South Australia introduced commodity treatment by EDB fumigation, for all bananas entering these States. This problem is receiving special, entomological attention, to devise fruit treatment methods to inhibit fly development in bananas.

CITY MARKETS AND INTERSTATE SUPPLY INSPECTIONS

Apples.—Moderate supplies of the 1964 crop continued until November. Quality had greatly deteriorated by then. Most of the 1964-65 crop has been of good quality and condition, although early supplies were mostly very small and somewhat immature. The crop overall was light, with a high percentage of the fruit very small to medium, due to drought.

Pears.—These came mainly from Victoria, Orange, Bathurst, and Batlow. The quality and packs of the N.S.W. fruit have been good, although most of the fruit has been small to medium. Victorian pears mostly packed in long pear or dump cases. Their quality has been inferior and in many cases did not conform to grade. Many of the lines were marked down, and two consignments were seized.

Oranges.—Valencias from Queensland and N.S.W. central coast were in heavy supply throughout the season. They were followed by heavy supplies from the M.I.A. and Murray Valley. In spite of the very dry conditions they were still being marketed in May, 1965 with little evidence of dryness. Early Navels from Queensland have been of excellent quality. Coastal Navels have been erratic in maturity and later than usual. Late Valencia and early Navel crops in 1965 overlapped, so no period of shortage occurred.

Mandarins.—The fruit from the 'Hills districts was small and heavily blemished. Queensland Ellendales were excellent and in great demand. There was a tendency to hold on to these too long, resulting in rather stale fruit towards the end of the season.

Lemons.—Volume of coastal fruit has been far more consistent than in recent years. Scale, verrucosis, and skin tarnish affected most of the fruit and much of it had to be marketed as plain grade. Queensland Meyers were quite early, arriving in March, 1965. They were excellent and mostly sold as special grade.

Grapefruit.—Local coastal fruit of only moderate quality and plain grade was followed by better fruit from the M.I.A. and South Australia. Demand was light and wastage from breakdown and moulds was high. Queensland fruit as in previous years has been best, and realised the highest prices.

Peaches.—Local fruit of the Spinks and Watts varieties were available in November, followed by mid-season and late varieties from the M.I.A. and central west. The fruit was excellent, with little incidence of brown rot.

Nectarines.—These were in light supply and very good quality.

Apricots.—Earliest fruit of the Glengarry variety were received in October. They were moderate quality but gradually improved. In November-December excellent fruit was available from local sources. This was augmented by fruit from the M.I.A. in January.

Cherries.—These were in heavy supply. Quality was excellent although the fruit was small.

Grapes.—Early supplies of fair quality Black Muscat were marketed in December from Queensland. Testing for maturity was done with the Brix test instead of the Baume test. To prevent immature Queensland fruit being marketed in Sydney, many Queensland growers had their grapes tested in that State and a certificate issued. Thus, less fruit was rejected on the Sydney market.

Plums.—This was an excellent plum season. Wilson and Santa Rose met the early season demand, followed by Narrabeen, Angelina and President varieties from the M.I.A. These ensured a long season of good quality fruit.

Bananas.—Supplies were maintained throughout the year. There was some over-production in summer, but not enough seriously to affect marketing of good quality fruit. Except for a short time in summer, when some narrow girth fruit was forwarded, quality was reasonable for the dry conditions. Packing has been satisfactory, with increased grower preference for "hand" packs in cartons.

Pineapples.—The fruit has been sound and in moderate supply throughout the season.

Strawberries.—Early strawberries were moderate quality but presentation has improved. North coast fruit arrived in October. From November onwards a regular supply of very attractive fruit packed in foil arrived from New Zealand. In all, a total of 13,500 cartons, each containing about 15 punnets, arrived from New Zealand.

Tomatoes.—Tomatoes were in fairly even supply throughout the year, without glut or shortage. The local season was longer than usual, due to mild conditions. During the Bowen season permission was given for trials of a volume-fill carton. For good quality fruit these cartons were very successful. South Queensland growers were also allowed to use this carton for their spring crop. Their fruit arrived in very good condition.

A new, quality regulation was enforced from 1st August, 1964. After a few months of grower uncertainty it resulted in notable improvement in tomato packs, especially from near metropolitan growers. These include many migrants.

Potatoes.—Drought again influenced the potato season, and potatoes from N.S.W. and Victoria had a high percentage of small tubers. Potato moth was not as evident as in the previous season, but many inland areas were affected by internal fleck.

Some 1,330,539 bags were forwarded to the Sydney Markets. Of these, 34,246 had to be branded in accordance with the new potato grading regulations and 19,454 bags were rejected and had to be regraded or rebagged. The main varieties were Brownells, Bismark, Crana, Bungama, Delaware, Exton, Kennebec, Kurrel, Murru, Pontiac, Up-to-date, Soranac, Sebago, Sequoia and Wallanga.

Vegetables.—Supply was consistent throughout the year and, considering the dry season, the quality was excellent. Packing and grading have greatly improved.

Second-hand Cases.—Owing to shortage of cases in Victoria, growers from that State had to purchase second-hand cases from New South Wales. Some 20,000 second-hand cases were fumigated with methyl bromide and sent to Victoria.

EXPORT INSPECTIONS

Fresh fruits, seeds, rice, wheat, and flour submitted for export were examined on behalf of the Commonwealth Department of Primary Industry under the provisions of the Commerce (Trade Descriptions) Act.

Apples.—A total of 182,055 cases and cartons of apples were shipped through the port of Sydney, an increase of 2,000 over the previous year. Most were consigned to the United Kingdom and Continent, with smaller quantities to Pacific islands. Rejects totalled 5,836 cases and cartons. Reasons were bruising, bitter pit, San Jose scale, russet, overmaturity, sunburn and lightweight cartons. Quality of fruit shipped was quite satisfactory considering the dry season.

Use of fibreboard cartons increased by 90,000. Only 15,000 were used in the previous season.

Pears.—The quantity shipped was 23,235 cases; about 11,000 less than the previous season. The reason was the light crop in New South Wales. Quality of the fruit was good. Most were shipped to Singapore, Penang and Pacific islands, with a smaller quantity to the United Kingdom. Only 254 cases were rejected for incorrect trade descriptions. Most of the fruit was supplied from Bathurst, the Murrumbidgee Irrigation Area and Forbes.

Citrus Fruit.—A total of 61,642 cases of Valencias were shipped; about 12,000 less than the previous season. The drastic cut was due to competition from South Africa on the Hong Kong and Singapore markets. The newer, Manilla market increased its quantity to 15,000. The remainder was shipped to Penang, Singapore and Pacific islands. Rejects totalled 326 cases, for phenyate burn and staleness.

Some 14,068 cases of Navels were shipped to Manilla, Penang, Singapore and Pacific islands, about 1,000 more than the previous season; 422 cases were rejected, for silver scurf, thick rind and oleocellosis.

Lemon shipments totalled 1,612 cases, about 11,000 less than the previous season; only 150 cases were rejected, for phenyate burn. Consignments went to the Pacific islands and Germany.

Only 825 cases of grapefruit were shipped, 1,000 less than the previous season; to the Pacific islands. Forty cases were rejected, for torn rinds.

A total of 2,429 cases of mandarins were shipped; 2,000 more than last season. The increased quantity was shipped to Vancouver.

Most of the citrus fruit exported was supplied from the Murrumbidgee Irrigation Area and coastal districts.

Grapes.—9,757 cases were shipped, an increase of 2,000. The fruit was high quality, and mostly consigned to Pacific islands and New Guinea. Only 198 cases were rejected, for incorrect pre-cooling temperatures. The fruit was supplied from the Murrumbidgee Irrigation Area.

Tomatoes.—8,508 cases of tomatoes were shipped, about 1,000 less than last year. Most were shipped to Pacific islands and New Guinea.

Cherries.—3,467 cases of cherries were exported, mainly to Pacific islands and New Guinea. It was high quality fruit, and supplied from Young and Orange.

Miscellaneous Fruits.—Peaches, plums, nectarines, passionfruit to a total of 5,771 cases, were consigned to Pacific islands and New Guinea.

Rice.—Some 75,925 tons of rice was exported, an increase of 33,096 tons over 1963-64. In the main it went to New Guinea, New Zealand, Pacific islands and Fiji. This year 2,214 tons was exported to Japan.

Seed.—Large quantities of seed were exported, mainly to U.S.A., New Zealand, Japan, Hong Kong, and Pacific islands. The total included 5,570 bags of pasture seed, 638 bags of tree seed, 46,165 bags of various cereal seed, 281 consignments of flower seeds, and 2,521 consignments of vegetable seeds in packets.

Plants.—233 vessels were surveyed under the Grain Regulations; 67 of these were rejected because of infestation and had to be cleaned, sprayed, or fumigated before permitted to load wheat.

A total of 2,155,835 tons of wheat was exported; more than half of it to China. The total was an increase of 293,993 tons over the corresponding period of last year. Rejections because of infestation totalled 713,172 tons.

Destinations of the wheat were: China, 1,213,412 tons; United Kingdom, 230,225 tons; U.S.S.R., 227,192 tons; Persian Gulf, 150,027 tons; New Zealand, 133,880 tons; Middle East, 71,446 tons; India, 39,904 tons; Beira, 32,135 tons; North Korea, 14,520 tons; Ireland, 8,045 tons; Norway, 2,837 tons; various small ports, 10,116 tons.

Flour.—A total of 136,344 tons of flour was exported; 48,000 tons less than in the previous year. Destinations of the flour were: Pacific islands, 70,081 tons; Colombo, 61,053 tons; Russia, 5,208 tons. Only 90 tons of flour was rejected this season.

IMPORT INSPECTIONS

Importations of plants and plant products from overseas were examined for the Commonwealth Department of Health, in accordance with provisions of the Quarantine Act.

Pasture Grasses.—A total of 48,377 sacks of pasture grass seed was imported; an increase of 6,000 bags on 1963-64 figures. Most came from the United States and New Zealand. Some small quantities came from Europe. In all, 1,300 sacks were quarantined and either fumigated because of infestation or recleaned to remove prohibited seeds.

Vegetable Seeds.—Imports for 1964-65 totalled, 1,800,745 lb, mainly from United States, United Kingdom, and New Zealand. This was a considerable increase on 1963-64 figures, and included a large quantity of pea seed.

Flower Seed.—Imports totalled 58,479 lb, a slight increase on 1963-64. Most was from the United States, Holland and Japan. Small quantities were from Europe and South Africa.

Nursery Stock.—Importations of all forms of nursery stock were about one-fifth higher than during the corresponding period of 1963-64. They included: orchids 3,901; ornamentals (incl. cacti) 3,403; bulbs, rhizomes, etc., 1,249; rose budding eyes, 2,115; sugar cane cuttings, 20.

The reduction trend in number of orchids imported continued, although only slight. The number of ornamentals more than doubled, due to larger bulk importations of camelias, alpines, pelargonia, and 725 cacti/succulents. Rose budding eyes were lower in total, but the number of bulbs increased.

Plant material from countries of accepted high standards of hygiene (e.g., U.S.A., U.K. and Western Europe) have been, on the whole, free of pest and disease. Importations from Central and South America, India, and parts of south-east Asia, showed infestations of mealy bugs, aphis, ants, scale and thrips. Viruses of orchids and ornamentals were the major disease problems.

The majority of plants other than orchids, accompanied by a Health Certificate, were fumigated with methyl bromide on arrival. Many appeared to suffer in the process. After representations from importers, bromeliads, mammilaria and pelargonia were dipped in insecticide in lieu of treatment by fumigation.

Parcels Post.—Examination of all goods and articles arriving from overseas through parcel post, and which are or may be subject to Quarantine Regulations, continued. In all, 7,128 parcels and packages were withheld for examination. Of these, 1,255 were detained for further examination, treatment or destruction. Contents of the parcels were mainly seeds, plants, bulbs, rice, cotton, popcorn and peanuts.

Passenger Ships.—263 overseas passenger vessels were met on arrival, for examination of goods and articles brought to attention by Customs. Considerable goods, prohibited and detected, were detained. These included fruit, plants, seeds, wood cases, wood ware, bamboo, etc.

Aircraft Inspection.—Flights of overseas aircraft arriving at Mascot totalled 4,462, an increase of 16 per cent over 1963-64. The aircraft discharged 276,654 passengers, an increase of 15 per cent. There were 1,080 inspections of quarantine cargo, and 515 consignments were held or treated and released. Some 13,500 cartons of strawberries arriving from New Zealand were inspected.

Cases and Packing.—At overseas wharves there was daily inspection of cases and packages containing general merchandise, for detection of sirex and wood boring insects. Infection was found in cases, casks, and bales with bamboo slats. All of these were treated under supervision either by fumigation or heat, or destroyed.

Dunnage.—Considerable dunnage was placed on the wharves from overseas' ships, and 269,500 super feet of this dunnage was fumigated under supervision and released. About 250,000 super feet was destroyed by burning.

Personal Effects.—There were 1,140 appointments made to inspect personal effects, and 37,107 pieces were examined. Of these, 1,010 pieces were held for quarantine and treated before release.

Quarantine—Waterfront.—Ships' cargoes were inspected regularly. One of the main items was imported motor vehicles. There was a slight decrease, from 40.5 per cent to 38.8 per cent, in used vehicles requiring steam cleaning. Total of vehicles inspected was 15,205.

Three complete shipments of dried figs from Turkey, totalling 10,047 boxes, were detained for mite (*Carpoglyphus lactus*) and ultimately destroyed by order of the New South Wales Department of Health. Importations of beans for processing—restricted—increased by 26,000 bags. The previous year's importations totalled 6,951 bags. Cashew nut cases from India were better quality this year, and not all were detained as previously. Raw spices from various countries were again, in many instances, contaminated with foreign seeds. Cleaning or grinding under supervision was required. Rice straw, rope, packing, chafing mats, and bags were again a quarantine hazard, and were destroyed by burning.

Potatoes.—Owing to the shortage of potatoes, permission was granted to import potatoes from New Zealand for processing. Some 25,000 bags were received.

Timber.—The total of timber imported into the ports of Sydney and Port Kembla during the 12 months ended 31st May, 1965, was 220 million super feet; an increase of some 4 million super feet over last year's figures. About 2½ million super feet was quarantined and treated. This was less than in the previous year. Imports of Douglas Fir, the biggest item, were down 20 per cent, but the quantity quarantined was up 50 per cent. The infestation was mainly *Grathotricus* spp. It was interesting that imports from Malaysia, Borneo and Indonesia were up 40 per cent, and that infestation was down 33 per cent. Import of plywood was up 50 per cent and no infestation was found.

DIVISION OF ANIMAL INDUSTRY

General

STAFF

Administrative Progressions

Mr R. M. Watts, Chief, Division of Animal Industry, was appointed Deputy Director-General of the Department. Mr R. A. Hall, formerly Deputy Chief, was appointed Chief of Division. The Deputy Chief position was then filled by Mr N. K. Golding; and Mr D. G. Christie succeeded him as Principal Veterinary Officer. Mr J. S. Healey was appointed to a newly created position, Principal Veterinary Officer (Extension).

Principal Livestock Officer (Poultry) Mr D. G. Duncan, retired. Mr G. D. Slennett was appointed to the position of Acting Principal Livestock Officer (Poultry).

Veterinary Staff Increase

Five more veterinary officers were appointed. One veterinary officer resigned. Ten vacancies remain in the Division's veterinary establishment. There are 25 vacancies for Pastures Protection Board veterinary inspectors. One veterinary inspector was appointed; one resigned.

One more veterinary research officer was appointed. And one veterinary officer was transferred from the field to the research section. There is one vacancy for a veterinary research officer. One veterinary research officer was on study leave to the CSIRO throughout the year. Another on post-graduate study leave to the University of Sydney.

Western Division Disease Control Supervision

Previously, disease control in the Western Division has been administered directly by Head Office of the Department. During this year a change was made. Now, District veterinary officers located at Narrabri, Dubbo, and Narrandera are responsible for disease control in that portion of the Western Division adjoining the respective Veterinary District. Thus disease control in all parts of New South Wales is now the responsibility of District veterinary officers.

Livestock Research Staff Increase

Five livestock research officers were appointed, bringing the total to 22. This is full establishment.

In the six research officer positions, there are two vacancies.

Livestock Officer Sections

Sheep and Wool Section.—The establishment was increased by one new position. Two vacancies exist. Eight new officers were appointed. Two officers resigned. Three were transferred to other sections of the Department.

Beef Cattle Section.—One new appointment was made. Another officer was transferred in from another section. One officer resigned. There is one vacancy.

Piggery Section.—Three appointments were made. One officer was transferred to another Branch. One resigned. Two vacancies exist.

Poultry Section.—Two officers were appointed. Strength is three below establishment.

Apiculture Section.—For the first time, a livestock research officer was appointed for research into breeding, nutrition and diseases of bees. There was no other change.

Overseas Visits by Staff

Two senior administrative officers made overseas visits. The Director of Veterinary Research was Australian delegate to the international meeting on hog cholera and African swine fever convened by the F.A.O. He also visited research establishments in the United Kingdom and U.S.A.

The Principal Veterinary Officer attended a course on exotic diseases at Grosse Ile, Canada. He also investigated disease control, conferred with administrators and visited research centres in Canada, the U.S.A., the United Kingdom and South Africa.

Livestock Health—Field Activities

REGULATORY DISEASE CONTROL

ANTHRAX

Thirty-five outbreaks were recorded. In most the number of deaths was low but in one the loss was 190 sheep.

All but two outbreaks were in the recognised anthrax belt. The two exceptions were in Young district; the first there for 14 years. In each, only a single cow died. One was the house cow of a town resident.

Four outbreaks in the enzootic area were on adjoining properties within the Macquarie marshes, where kangaroos and feral pigs were prevalent. The pigs partly consumed the carcasses of many of the dead cattle. Deaths of feral pigs and kangaroos were reported but determination of anthrax as cause was not possible.

Stock routes and reserves where anthrax deaths had occurred in the preceding five years were quarantined for the summer; 19 were quarantined. Use was limited to stock vaccinated against anthrax or conveyed by motor vehicles.

The following table shows the distribution of outbreaks:—

Administrative District	Outbreaks	Stock Quarantined				Deaths			
		Cattle	Sheep	Pigs	Horses	Cattle	Sheep	Pigs	Horses
Central West	1	5	..	22	2	..	..	2	..
South	2	35	..	..	..	2	..	..	..
North West	4	1,652	1,250	..	..	14	..	..	..
West	19	389	25,957	419	11	7	289	27	1
South West	6	44	5,191	..	2	3	102	..	2
Far West	3	110	2,200	4	9	5	390	1	2
Totals	35	2,235	34,598	455	24	31	781	30	5

BRUCELLOSIS (PIGS)

No outbreaks was diagnosed. The voluntary, brucellosis-free herd scheme was maintained and 16 herds were accredited. Pigs tested in such herds numbered 284. All were negative.

CATTLE TICK (BOOPHILUS MICROPLUS)

In the previous year, illegal introduction of a cattle mob from Queensland caused infestation of an area in the north west where cattle tick is not enzootic. The eradication measures continued. Early in 1965, restrictions were relaxed for more freedom of stock movement. Later, all restrictions were removed. The area is not now in quarantine.

Cattle tick control in the enzootic area is dealt with in the Board of Tick Control section of this report.

FOOT ROT (SHEEP)

This was widespread in the spring, with wet conditions in most sheep areas. However, subsequent onset of drought greatly reduced incidence, although sporadic outbreaks occurred.

In the Armidale Foot Rot Quarantine Area, seven fresh outbreaks occurred; a marked reduction on 40 diagnosed outbreaks in the previous year. Drought was undoubtedly the main cause of reduction.

Twenty-nine holdings were in quarantine at the start and 18 at the end of the year. With seven additional outbreaks, the disease was overcome on 18 holdings.

Infection was eliminated from 13 of them by treatment combined with disposal of obstinate cases, and from five by disposal of all infected and in contact sheep for slaughter.

No fresh outbreak has been diagnosed during 1965 in the Armidale area. Three Department of Agriculture foot rot inspectors were appointed to assist in the area's eradication programme.

JOHNE'S DISEASE

Two outbreaks were recorded. In each, only one infected animal was found. Quarantine was maintained on three holdings where the disease had been previously diagnosed. One such property was released.

Of the two new cases, one was a bull which died from severe *Ostertagia* spp. infestation. No lesions of Johne's Disease were apparent on necropsy but *Mycobacterium johnei* was found by laboratory examination.

The second case was on a property with a previous history of the disease. This holding had been in quarantine from 1958 to 1962. Several cases of the disease occurred in that period. The holding is in a high rainfall area, where hot summer temperatures are not usual. The affected cow was destroyed in extremis, after exhibiting typical clinical symptoms. Only small lesions were found on necropsy.

PARASITES EXTERNAL (SHEEP)

The next table shows distribution and numbers of holdings and sheep quarantined for lice (*Damelinia ovis*) and ked (*Melophagus ovinus*):—

Administration Area	For Lice		For Ked		For Lice and Ked	
	Holdings	Sheep	Holdings	Sheep	Holdings	Sheep
Central	31	39,002	..	..	..	..
Central West	180	150,425	30	26,659	5	5,410
Cumberland	5	780	1	41	..	..
Far West	40	165,800	..	..	..	..
North	135	186,627	11	8,966	8	9,376
North East	..	..	..	..	..	..
North West	150	380,348	..	..	..	..
South	162	156,739	4	4,093	..	..
South East	107	124,751	58	56,600	10	9,310
South West	165	126,956	..	..	..	..
West	53	82,709	..	..	..	..
Totals	1,028	1,414,137	104	96,359	23	24,096

PLEUROPNEUMONIA CONTAGIOSA (CATTLE)

There was no outbreak. Queensland cattle entering N.S.W. were kept under surveillance. Restrictions were kept on entry of cattle into the two protected areas. Many tests were carried out, on cattle moving to other States or exported to other countries. No reactor was detected.

PULLORUM DISEASE

Flocks were tested under the voluntary accredited flock scheme, and under regulations to the Stock Diseases Act requiring annual testing of flocks from which chickens under 3 weeks of age or hatching eggs are sold. The next table shows details for the two categories:—

Scheme	Flocks	Birds	Reactors	Reactor Percentage
Accredited Flocks	98	627,193	2,514	0.4
Compulsory Testing	110	171,493	1,440	0.8
Totals	208	798,686	3,954	0.5

The 627,193 tests under the accredited flock scheme was a big increase on the previous year's 399,153 tests. Compulsory testing was less than in that year. Reactors in accredited flocks increased from 0.09 per cent to 0.4 per cent. Elimination of infection from one flock of about 30,000 birds was difficult. In this flock 82,817 bird tests were done, detecting 1,582 reactors.

Swine Fever

No outbreak was recorded. This was the second consecutive fiscal year of New South Wales freedom from clinical cases.

Transmission tests were done, using material from pigs on ten properties where mortalities occurred. Histopathologically, suspicious cerebral lesions were found in pigs from seven of these holdings. But the transmission tests proved negative, and reactions to the gel diffusion precipitin test were not significant. Two of the mortalities were on properties where swine fever occurred three years before and all pigs had then been destroyed.

Regulations in operation in the previous year to prevent spread of the disease were continued. Boiling of food refuse before feeding to pigs is compulsory; and sale of pigs in public saleyards, for purposes other than immediate slaughter, is prohibited.

The practice of placing privately sold pigs in public saleyards for transhipment to purchasers' holdings, has developed. Therefore, regulations under the Stock Diseases Act have been amended to provide that all pigs placed in public saleyards must be either moved to a slaughtering establishment or return to the property of origin. Previously this only applied to pigs placed in saleyards for actual sale. However, the ban on public sale of pigs was relaxed to permit stud pig sales in conjunction with exhibitions.

Trichomoniasis (Cattle)

One outbreak was recorded. The property was placed in quarantine. Seven properties were released from quarantine, after apparent eradication of the disease. At the end of the year quarantine remained on two properties. This is the least number of herds quarantined for many years. In the herd where the disease was diagnosed there had long been an infertility problem.

Tuberculosis (Cattle)

Area Eradication Scheme.—The programme initiated in 1960 was continued. Eighteen more quarantine areas, containing an estimated 335,000 cattle, were gazetted. This brought the totals to sixty-nine areas and about 1,316,000 cattle. All are coastal areas.

Testing is annual until incidence falls to 0.5 per cent then biennial. Annual and biennial tests are done by approved practising veterinarians. Cost is borne by the stockowners. Re-testing of infected herds is done by official veterinary personnel, without charge. Reactors are slaughtered under supervision at abattoirs, with indemnity to owners. The year's testing is summarised in the following table:—

Test	Areas	Cattle Tested	Reactors		NVL Reactors	
			Numbers	Per Cent	Numbers	Per Cent
1st Round	40	262,101	1,302	0.50	388	29.8
2nd Round	21	155,959	166	0.11	70	42.2
3rd Round	12	88,091	178	0.21	66	37.1
4th Round	1	1,862	Nil	..	Nil	..
Retests	54	89,667	624	0.69	176	26.6
Introduction	55	31,548	104	0.33	39	37.4
Totals	62*	629,228	2,374	0.38	739	31.1

* In some areas a round was ended and another was started during the year.

Although tests were done in sixty-two areas, compared with forty-six in the previous year, the total of tests was less—because the drought seriously dislocated the testing programme. Deferment of testing was necessary for many herds, where cattle were weak through feed shortage. Also, stock movement to agistment in other localities affected the campaign.

Some 31.1 per cent of all reactors did not show visible lesions on slaughter; compared with 19.9 per cent in the previous year. Although this might seem a big increase it is not so when incidence is expressed as percentage of total cattle tested; 0.11 per cent of all cattle tested in 1963-64 were NVL reactors compared to 0.12 per cent in 1964-65.

However, although the average situation in regard to NVL reactors was satisfactory, a large proportion of reactors in several localities failed to show lesions. Non-specific sensitization is believed to be the cause. In two adjoining areas, of the 162 reactors detected in forty-nine herds during July and August 135 were apparently free from tuberculosis. Retesting positive reactors by the short thermal method was therefore adopted in the localities involved.

Tubercle Free Herd Scheme.—Under this voluntary scheme of accreditation, eighty-four herds and 11,324 head of cattle were tested. There were twenty-six reactors. Fifty-three herds listed as tubercle-free but subject to biennial testing were not tested this year.

Tubercle Free Milk Scheme.—This is designed to ensure that non-pasteurized milk sold for human consumption is from accredited herds. The New South Wales Milk Board is the administering authority for the larger cities, small cities and towns, and municipal and shire councils. Certification of freedom from tuberculosis is a Department of Agriculture responsibility. Cattle tested under this scheme totalled 18,090. Of these, thirty-six were positive.

Miscellaneous Testing.—This included compulsory testing of known infected herds outside of eradication areas; and voluntary testing for export, sale, exhibition or diagnostic purposes. Cattle tested totalled 48,968. Of these, 577 reacted.

Tuberculosis (Poultry)

Thirty-five properties were placed in quarantine following diagnosis of this disease. All but two were in the known enzootic area. Eradication is effected by consigning for slaughter all birds which are infected or have been exposed to infection. Birds are allowed to reach marketable age before consignment. After their consignment, contaminated ground is spelled for two years.

Incidence was surveyed in small household poultry flocks in the town of Cootamundra, in the enzootic area. The tuberculin test was applied to 28 flocks. Reactors were detected in 21 flocks but incidence in each infected flock was low. On most of the negative properties the birds had been run under semi-intensive conditions. On almost all the infected properties the poultry had free range.

GENERAL DISEASE PROBLEMS

Arthrogryposis

Incidence this year was unusually high. Most of the affected calves were born on the south coast and adjacent tablelands. Some 1,200 cases occurred, in about 700 herds. Incidence in any one herd was mostly low. It ranged from one animal to 8 per cent of calves born. But in one herd 62 of the 120 calves were affected.

Cause of this condition has not been determined. In one herd where affected calves were born, some cows had shown leg weakness, transient lameness, laboured respiration and nasal discharge at the 6th to 7th month of pregnancy.

Lesions ranged through severe muscle atrophy, absence of some neurones in the ventral spinal cord and gliosis of the CNS. There were also degrees of hydranencephaly extending to complete absence of the forebrain.

Subsequently, the CSIRO Animal Health Laboratories, Parkville, undertook to examine 168 bovine sera for presence of antibodies against infectious bovine rhinotracheitis virus. Paired sera were obtained, from apparently normal dams and dams which had produced abnormal calves on the same property. The results failed to suggest any correlation between these conditions.

Blindness in Shorthorn Calves

On several properties, a congenital blindness has affected beef shorthorn calves. In each affected herd there have been only a few cases per year. All blind calves have been white; much whiter than the creamy white of typical white Shorthorn calves. But they have not been typical albinos. They have had red hairs on the face and in the ears.

Eyes from affected calves subject to necropsy have consistently shown detached retina. Other variable abnormalities are a chronic iridocyclitis, formation of scar tissue behind the lens, opacity of the vitreous humour, and lens liquefaction.

BONE FRAGILITY

Bone fragility occurred in 4-5 months lambs on two properties. In one case the animals had been grazing on an oat crop, and, in the other, on a wheat crop. The former were more severely affected, with 300 of the 1,300 showing symptoms. Affected lambs developed fractures in one or more limbs. The bones of affected animals were normal, in general, but with shaft width of the long bones slightly reduced.

Histopathological examination revealed no evidence of rickets and only slight irregularities of the epiphyseal cartilages. Numerous mononuclear cells containing basophilic granules were in the bone marrow. Serum calcium, serum magnesium, blood phosphorus and liver copper were normal.

BRUCELLOSIS (CATTLE)

Brucellosis, widespread and particularly in dairy herds, caused many abortions. The value of strain 19 vaccine was publicised to further spread its voluntary use. Nine herds were accredited under the voluntary, brucellosis-free herd scheme. In these, 636 cattle were tested with negative results.

COCCIDIOSIS (SHEEP)

Coccidiosis was prevalent in the winter on the tablelands. In particular it affected lambs held in small paddocks for drought, hand feeding. In one outbreak 400 of 1,870 weaners were lost. The most widely used drug was sulphadimidine. It was efficient under field conditions.

COLIBACILLOSIS

This commonly affects young dairy calves but is relatively rare in beef herds. This year it was a serious problem in two beef herds, even though all calves were paddock born and suckled their dams. Treatment under conditions of beef cattle husbandry presents great practical difficulties.

COPPER DEFICIENCY (SHEEP)

Occurrence was confirmed in the Warialda district by low liver copper levels. Steely wool had been observed in the particular flock at shearing. It was the first copper deficiency diagnosis in the area.

CYSTICERCUS BOVIS

Incidence was surveyed in collaboration with the Commonwealth Department of Primary Industries. Meat inspectors at all major slaughtering establishments sent material from suspected cases to the Glenfield Station; 21 specimens. Dissected under a stereo-microscope, only lesions from four carcasses proved positive. But most of the other specimens appeared to comprise degenerating *C. bovis*. Of the confirmed cases, one affected beast had grazed on a sewage farm. The other affected cattle could have had access to human excreta but this could not be confirmed.

ENTEROTOXAEMIA

Enterotoxaemia in sheep was extensive early in the year. Abundant rain had provided lush pastures. In a heavy mortality later in the year, under drought conditions, 90 of 400 sheep died. The stock were being hand-fed but kept in a paddock where there was heavy growth of stinkwort (*Inula graveolens*). Sheep predisposition to enterotoxaemia when grazing flowering stinkwort has been previously noted.

Enterotoxaemia in cattle was diagnosed to a greater extent than previously. In at least one dairying district, it was the most prevalent cause of bovine deaths. Forty-five sets of intestinal contents and smears were submitted to the Glenfield Station. A strong toxin was found in nine samples; a toxin too weak to type was in eight; while no toxin was found in 28 samples—possibly because of the lag between field collection and the examination. Of the nine samples of strong toxin, neutralization in six was achieved with *Clostridium perfringens* type D antiserum; in one case with types B and C antiserum; while in two cases, no neutralization resulted from antisera types A, B, C, D or E.

FACIAL ECZEMA

Facial eczema was diagnosed for the first time in N.S.W. It was in southern tablelands sheep on rye grass pastures. Incidence was low. Diagnosis was on facial lesions and liver histopathology.

LEUCOSIS

This is the major poultry disease problem; causing some 12 per cent of mortalities in birds up to 14 weeks and 5 per cent in older birds. In some exceptional outbreaks there were losses of 30 per cent. The disease also involved chickens five weeks old. Visceral forms were the most common, followed by neural forms causing paralysis and leg weakness. Extra riboflavin in the diet seemed to be of benefit, for the neural form.

LISTERIOSIS

Listeria monocytogenes was recovered from a foal which died at a Departmental agricultural college. Listlessness, a slight scour and mild temperature rise were followed by coma and death. The liver was enlarged and congested and the spleen swollen with some subcapsular ecchymoses.

LIVER FLUKE

During the late summer and early autumn, heavy mortality was sustained on the tablelands from infection with larval *Fasciola hepatica*. Abattoirs in the area reported heavy losses from condemnation of lamb livers. In January, 70 per cent of all sheep livers and 30 per cent of all cattle livers at one abattoir were condemned for larval fluke.

MUSCULAR DYSTROPHY

A number of outbreaks of white muscle disease occurred on the northern and one on the southern tablelands, in the period October to January. There was no heavy mortality.

A muscular dystrophy was seen in two merino flocks in southern N.S.W. In one, incidence amongst eight months old sheep was 20 in 500; in the other, 11 in 900 were affected. Gait was abnormal; stiffness and abduction affecting the hind limbs. On necropsy, pallor of some skeletal muscles —notably the vastus, intermedius and soleus—was seen.

Histopathological examination showed swelling, fragmentation and atrophy of muscle fibres, proliferation of sarcolemmal nuclei and fibroblasts, and fatty infiltration. These changes were found in numerous muscles besides those macroscopically seen to be affected, and appeared to be bilateral.

NECROTIC ENTERITIS (POULTRY)

This is now important in broiler flocks, particularly at Tamworth. In one case 230 of 400 birds were lost. The agent appears to be *Clostridium perfringens* but *Vibrios* have been found in intestinal tissue of some affected birds. Pronounced enlargement of the intestinal wall occurs, with Persian carpet-like lesions on the mucosa. Penicillin has been of some value.

OEDEMA DISEASE

This was more frequent than hitherto. On the far north coast, where pigs are more concentrated than elsewhere in the State, this is now the main cause of mortality. On one property it caused loss of 100 young pigs from 40 sows.

POISONING

Algae.—Several mortalities followed consumption of water heavily contaminated with the blue-green alga (*Anacystis cyanea*). Algae concentration had been increased by partial drying of dams by drought. In one case toxicity arose from algae concentration on one side of the dam by wind. Sheep drinking from this side of the dam died. Those drinking from the opposite side were unaffected.

Observations at the Veterinary Research Station, Glenfield, showed *Anacystis cyanea* toxic for mice. The toxin was not destroyed by boiling. Held at 5°F it was stable for a month.

Arsenic.—Arsenic was again responsible for more stock losses than were other toxic materials; 49 cases of arsenic poisoning were investigated. Post-dipping losses, where arsenic had been used, accounted for most deaths. These losses usually followed failure to take the recommended precautions. Deaths also followed access to areas treated with arsenical weedicides, and to stored arsenic.

Cotton Fire Weed (Senecio quadridentata).—Ingestion of this weed caused heavy losses in cattle on four Upper Hunter properties between October and February. Pyrrolizidine alkaloid was the toxic content. Liver damage typical for this alkaloid was found.

Prolific growth of the plant had followed paddock top-dressing with superphosphate and gypsum. Heavy stocking over a dry winter had resulted in pasture shortage, and cattle had to graze this otherwise unpalatable plant.

Effectiveness of cobalt bullets in preventing mortality from this plant is now on trial on one of the affected properties. To the end of the year there was no sickness in treated or control animals.

Fungi.—In a case of mouldy corn toxicosis, 11 of 40 cattle died. The cattle had grazed a heavily mould-contaminated, stunted corn crop. Enteritis, impaction of the omasum and haemorrhages in the intestines, on the heart and in other parts of the body, were found on necropsy. Moulds on the affected corn included *Aspergillus, Mucor* and *Penicillium* spp.

Grain.—Many cases of grain poisoning in sheep and cattle occurred under the drought, handfeeding conditions. Losses in the main followed feeding with manufactured pellets and, less so, wheat.

Despite publicity by the Department, many owners did not adopt the recommended introduction of grain to stock in gradually increasing quantities. But not all losses were due to improper feeding methods. In some cases, manufacturers changed the pellet ingredients. Thus, after a fresh consignment, losses occurred because stock were not adapted to the changed ingredients.

In other cases, particularly with young sheep, inducing animals to eat the available feed was difficult. Various strategies had to be applied. When stock finally ate the feed, they often ingested such excessive quantities as caused mortality.

In some cases the quantity of feed required was underestimated. This led to excessive hunger. Then, more forward animals ate more than their share and became affected. At other times, losses followed accidental access to feed.

Insects.—Cattle mortalities occurred on two adjoining properties in the Moree watercourse country. Paddocks were flooded to a depth of 6 to 12 inches, and the only feed available was in the water. All plant matter above the water was literally covered with small insects which the cattle had to eat with the feed. Death within six hours of onset of symptoms was usual; ataxia followed by prostration. The insects were identified as *Anaxilaus exiqua.*

Phalaris tuberosa.—In the autumn and early winter months some serious mortality occurred in sheep and to a lesser extent in cattle grazing *Phalaris tuberosa.*

This grass had been known to sometimes develop toxic alkaloids but, generally, there had been little trouble in past years. This year the drought favoured development of toxic alkaloids. Lack of rain prevented growth of clover and other grasses. When light rain occurred the *Phalaris* made striking growth and dominated pasture swards.

Losses could generally be avoided by restricting grazing on *Phalaris* pastures to two hours in the late afternoon, when alkaloid content is at its lowest; and ensuring that stock had previously received other feed.

Sodium fluoacetate (1080).—Some heavy mortalities in sheep were due to ingestion of this material. It is widely used for rabbit destruction. Baits were usually impregnated, chopped carrot. Because of no rain, baits not ingested by rabbits dehydrated—instead of rotting; toxicity was retained, and losses occurred up to seven weeks after baits were deposited. Moistened by light rain, the bait's attractiveness to stock increased. Field evidence suggested that sodium fluoacetate toxic effects are cumulative.

Urea.—This was widely provided for sheep and cattle, as part of drought feeding. Generally it was in manufactured mineral blocks, but other urea mixtures were used. In some cases urea was added to feed.

Several mortalities from urea poisoning were investigated. Excessive ingestion, causing toxicity, was frequent where blocks were softened by rain. Defective manufacture sometimes caused soft areas in normally hard blocks. In other cases, urea had not been evenly mixed in a block. Some poisonings were associated with manufactured pellets containing 1½ per cent urea. In weekly feeding with such pellets, ingestion of toxic levels sometimes occurred.

Polioencephalomalacia

Twenty-four cases were recorded in sheep; 17 in the last three months of the fiscal year—when the drought had worsened. All ages and classes of sheep were affected. Only small numbers were involved. But on one property the mortality rate was 10 per cent amongst 4-tooth merino wethers.

Symptoms were dullness, anorexia, ataxia, opisthotones, apparent blindness, inability to stand, and nystagmus. Stress of a declining plane of nutrition has been suggested as an aetiological factor.

Round Heart Disease (Turkeys)

This condition observed in turkeys was characterised by a high mortality, distended flabby heart and liver cirrhosis. The outbreak involved 240 deaths in 300 poults during their first four weeks. Sick birds appeared depressed, with ruffled feathers and unsteady gait. Some showed nervous signs, e.g., headwaving, and blindness. The cause remains unknown.

Bacteriological examinations and attempted transmission to embryonated eggs did not reveal cause. A toxic factor was postulated in the feed, but a feeding trial wtih one week old poults was also negative. A limited examination of possible biochemical factors—thiamine, choline, biotin and a source of the Vitamin B complex (Marmite)—was undertaken, with negative results. Of 57 poults in experiments, only 10 survived from the various groups. These recovered after one month's observation. No genetical association could be established.

Viral Polyarthritis Demonstrated

Viral polyarthritis has been suspected for some time in N.S.W. In the past, several polyarthritis outbreaks in young sheep of British breeds and their crosses have been investigated unsuccessfully. Elementary bodies have been seen in smears of synovial fluid from affected joints. But early attempts at egg-isolation of an organism had failed.

This year a virus of the psittocosis-lymphogranuloma group was isolated from affected animals in the yolk sacs of developing hens eggs at the Veterinary Research Station, Glenfield. It was transmitted to sheep by intravenous inoculation of infected yolk-sac material. Severe arthritis with systemic illness developed about a week after transmission and lasted about ten days. Attempted transmission from sheep to sheep, using synovial fluid as inoculum, did not succeed.

Histopathological examination showed distinctive inflammatory changes in the synovial membranes and central nervous system.

MISCELLANEOUS ANIMAL HEALTH ACTIVITIES

Extension Service by Veterinary Personnel

Extension work on an individual-contact basis was done by veterinary officers and veterinary inspectors when investigating herd and flock problems. Group and mass media extension were also considerable. Demonstrations were given at 24 field days. Lectures and demonstrations were given at 73 meetings. Radio broadcasts totalled 74, and six television appearances were made. Numerous articles and paragraphs were released to the press, radio and television services.

Many of the field days and lectures comprised segments of drought feeding schools, on scientific feeding in drought conditions. One, two-day school on the fundamentals of sheep nutrition was conducted.

Clinical Attention at Government Farms

The veterinary officers duties include clinical attention to government-owned livestock. This year, 167 such services were given on 37 farms or institutions conducted by eight Departments or Boards. The work included disease testing, vaccination, diagnosis, treatment, pregnancy determinations and post-mortems.

In-service Training Schools

Artificial Insemination.—Five schools to train artificial inseminators were held at the Veterinary Research Station, Glenfield. Certificates were issued to 18 successful candidates. Fourteen were Milk Board nominees, two were Department of Agriculture officers, one was from the Commonwealth Department of the Interior and the other a private candidate.

Pregnancy Diagnosis.—Two schools were held at the Veterinary Research Station, Glenfield, to train veterinary inspectors in pregnancy diagnosis. Ten veterinary inspectors attended.

Exotic Diseases.—District veterinary officers attended a school in exotic diseases conducted by the Division of Veterinary Hygiene, Commonwealth Department of Health.

Laboratory Diagnostic Services

Specimens received at the Veterinary Research Station, Glenfield, totalled 55,417; a significant increase on the 44,997 of 1963-64.

The newly established District Veterinary Laboratory at Armidale has now been opened. Staff comprise an Officer-in-charge (Dr A. R. Jackson), one laboratory assistant, two laboratory attendants-in-training and one animal attendant. A veterinary research officer will be transferred from Glenfield soon. The laboratory will receive diagnostic specimens from the areas of the Armidale and Narrabri District veterinary officers.

Test Mating of Bulls

All bulls intended for use at artificial stock breeding centres in New South Wales have to be test mated at the Veterinary Research Station, Glenfield, for diagnosis of possible genital infections; also tested for tuberculosis, brucellosis, leptospirosis and contagious pleuropneumonia. Twenty-one bulls were test mated this year. Three failed to pass all tests. The test mating technique now includes use of double exposure, enucleation of corpora lutea and insemination with semen plus preputial scrapings, in place of natural service.

Rabbit Myxoma Virus

Release of rabbit myxoma virus continued from the Veterinary Research Station, Glenfield. Doses released totalled 60,825, including 1,725 doses interstate—to Tasmania, the A.C.T. and the CSIRO. Those figures are greater than for four of the immediate five preceding years.

Regulatory

STOCK FOODS AND MEDICINES ACT

Stockfoods registration applications were made by 261 firms. Fifty of these had not been dealt with by the end of the fiscal year. Of 1,901 stock foods concerned in the applications, 1,851 were registered. Drought caused an increase in applications for registration of stock feeds and licks, containing urea.

To maintain a check on quality of registered stock feeds, a process of routine sampling was introduced; each District veterinary officer arranged for early submission of 12 samples of registered stock feed for analysis.

The Stock Medicines Board met 13 times and considered 1,634 applications for registration of stock medicines. Of the total, 1,341 were re-applications. The remainder concerned new products. Registration was not granted in ten cases. Eleven applications were withdrawn.

CATTLE COMPENSATION ACT

Number of Claims.—Claims dealt with totalled 9,827 and involved 14,835 animals. Compensation payments amounted to £232,323 2s. 10d. Compared with the previous year the number of claims and the compensation total each slightly increased.

Diseases Concerned and Payments Made.—Diseases and the compensation paid were as follows:—

Disease	Claims	Paid		
		£	s.	d.
Tuberculosis	2,006	97,141	1	0
Cancer	4,165	80,372	19	7
Actinomycosis	2,395	35,119	1	8
Actinobacillosis	1,186	15,461	16	7
Pleuropneumonia	1	35	0	0
Trichomoniasis	1	16	11	1
Babesiosis	72	4,132	17	11
Johne's Disease	1	43	15	0
Total	9,827	£232,323	2	10

Claims Disallowed.—Claims for compensation were disallowed in 272 cases, as follows: for delayed notification of disease by owners, 156; for failure to notify disease, 77; for failure to pay compensation levy, 35; for delayed application for compensation, 4.

Compensation Fund.—At the end of the fiscal year, the fund held £785,444 8s. 5d.; £57,531 15s. 3d. more than at the end of the previous year. Receipts from the annual levy on live cattle were £7,890 less than in the previous year, while stamp duty on cattle slaughtered increased by £9,799. These changes were drought effects. Administrative costs were £3,781 lower.

BOARD OF TICK CONTROL—CATTLE TICK CONTROL

Eradication Measures

North Eastern Maclean Area.—A surveillance policy was maintained until 31st December, 1964. From that date the area was released from quarantine as no evidence of cattle tick was detected.

Currawinya Area.—During the second round of inspections at 21-day intervals, commenced in January, 1965, a single female *Boophilus microplus* was found. Origin of the infestation could not be determined. Because of the finding, the area reverted to a policy of control.

Drake Area.—The fifteen months' dipping programme, started in 1963, ended in January, 1965. A policy of examinations at 21-day intervals was then started. This continued until 30th June, 1965. No evidence of cattle tick was found.

Detection of Cattle Tick in Clean Country

Grafton Area.—In May, 1965, an infestation was detected on an animal slaughtered at Grafton Abattoir. Further investigations revealed cattle tick on a Pillar Valley property. Other holdings were later found infested in that locality and near the coast north of Wooli. The Grafton Quarantine Area was, therefore, re-gazetted. Arrangements were then made to re-establish control, by erection of gates and maintenance of the boundary fences. The area was closed off by 18th June, 1965.

Buccarumbi Area.—Investigations revealed that cattle had been moved from Pillar Valley to Buccarumbi in April, 1965. Subsequently, one cattle tick was detected during examination of these cattle. Quarantine was imposed on the properties involved.

Kempsey Area.—Investigations revealed that some of the same cattle had been moved to Kempsey. So, quarantine was imposed on the holding to which the cattle went.

Babesiosis—Tick Fever

Babesiosis became the Board's major problem. The first outbreak was in the Kyogle Area in July, 1964. The Cattle Tick Research Station, Wollongbar, undertook testing of cattle on this property and adjoining holdings. Through positive tests 10 more holdings became involved in the next three months. Between December, 1964, and March, 1965, 32 outbreaks of the disease occurred in the Kyogle Area.

Blood tests between January and June, 1965, on holdings adjoining outbreak properties, revealed carriers on 64 more holdings. By 30th June, practically the whole of the Kyogle Area except the south-west corner had become involved with tick fever outbreaks.

In January, 1965, the first case ever recorded west of the Richmond Range was confirmed at Boomi Creek, in the Woodenbong Area. A second occurred on Beaury Creek. Subsequently, complement fixation testing of adjoining holdings revealed carriers on six more properties.

In the Tweed Area during January and February, 1965, there were three outbreaks. Testing then revealed carriers on three more holdings. Two outbreaks occurred in the Richmond Area and carriers were revealed on one property.

The situation as at 30th June, 1965, was as follows:—

Area	Tick Fever Outbreaks		Adjoining Holdings in Quarantine not yet tested	
	Holdings	Stock	Holdings	Stock
Kyogle	87	17,309	146	18,124
Tweed	6	533	24	1,828
Richmond	3	290	10	768
Woodenbong	8	1,550	13	2,984
Totals	104	19,682	193	23,704

Measures to control the tick fever outbreaks included:—Cattle dipping at 14 day intervals for 12 months; complement fixation testing when outbreaks occurred and at the end of the 12 months dipping; and extension of quarantine for three months after retest when carriers were detected.

The widespread incidence of tick fever had a major effect on all policies and activities within the Tick Quarantine Areas, owing to the need to provide more staff to control the outbreaks.

Control Policies

The 1964-65 policies differed from the previous year's because of the changed circumstances.

Areas East of Richmond Range.—Within the Richmond, Tweed and Kyogle Areas, stock on all holdings were given five dippings at 21-day intervals between September and December, 1964. In the Richmond Area, a programme of examinations was carried out after the dippings.

In January, 1965, an additional programme of four treatments was commenced in the Kyogle Area because of the tick fever situation. Restrictions were also imposed on movement of stock. In March, 1965, extra dippings were commenced in the Tweed Area, for the same reason.

Infestations detected during the past four years have been as follows:—

Area	Number of Infestations Detected			
	1961-62	1962-63	1963-64	1964-65
Richmond	53	93	123	241
Kyogle	3	19	60	53
Tweed	4	7	12	33
Totals	60	199	195	327

Far more inspections were done in the Richmond Area, compared with the previous year. The dipping programmes in the Kyogle and Tweed Areas would have reduced tick incidence. The figures for these areas therefore cannot be compared with the figures for the previous year. The number of infestations classified as "heavy" showed an increase over the previous year.

Areas West of the Richmond Range.—No organised policy of treatments was carried out. Some stockowners undertook voluntary dipping, particularly in the Woodenbong Area. A policy of examinations before movement was continued. In the Woodenbong Area a policy of treatments before movement was adopted after tick fever was detected.

Detected infestations in the Woodenbong and Bonalbo Areas showed an increase. Figures for infestations detected in the past four years are as follow:—

Area	Number of Infestations Detected			
	1961-62	1962-63	1963-64	1964-65
Woodenbong	2	..	..	13
Bonalbo	..	..	1	4
Tabulam	..	2	1	2
Rivertree	2	..	1	..
Copmanhurst	..	..	4	..
Totals	4	2	7	19

Inspections Outside the Tick Quarantine Area

Abattoirs.—Retention of inspectors at Grafton, Macksville and Tenterfield Abattoirs continued. The inspector at Grafton detected cattle tick. This resulted in regazettal of the Grafton Quarantine Area. Large numbers of *Haemaphysalis* and *Ixodes* ticks were found at Macksville and Grafton Abattoirs. No evidence of ticks was detected at Tenterfield. The inspector at Tenterfield Abattoir supervised the unloading of cattle moving from Wallangarra by train and the pre-slaughter dipping of all ex-Queensland calves.

Cattle on Holdings in Clean Country.—Check examinations of cattle were made on a random selection of properties in clean country. No cattle tick was detected.

Claims for Compensation

Compensation claims were paid for loss of 280 head of stock by death or injury, involving £6,152 14s. 0d.

Tick Board Laboratory Activities

Particulars of research undertaken by the staff of the Board of Tick Control Laboratory are shown in the livestock health research section of this Report.

The volume of routine work increased by more than 20 per cent, compared with the previous year. It comprised the following analyses for the past two years:—

Analysis	1963-64	1964-65
Dip samples	10,033	11,458
Hair samples	1,931	3,025
Animal products	640	793
Spray samples	235	127
Total	12,839	15,503

And 500 gallons of paint was manufactured, compared with 263 gallons in the previous year.

MEAT INSPECTION SERVICE

Staff

Staff establishment (all grades) increased from 184 at 30th June, 1964, to 198, but there were seven vacancies at 30th June, 1965.

New Abattoirs

Two new abattoirs commenced operations, at Guyra and Mudgee. Four State meat inspectors have been stationed at Guyra and six at Mudgee.

Joint Inspection by State and Commonwealth

The arrangement between the State and Commonwealth for joint meat inspection services at all export abattoirs continued to work well.

Carcasses Inspected by State Services at Slaughter

Number of carcasses inspected at the time of slaughter increased, except in the case of sheep. The 1964-65 volume of inspections has been tabulated:—

	Cattle	Calves	Pigs	Sheep	Goats
State Abattoir	178,421	123,271	136,733	2,322,883	586
County of Cumberland (excluding State Abattoir)	41,652	35,977	15,091	797,939	..
Country Abattoirs	625,404	263,793	319,707	3,083,980	..
Totals in N.S.W.	845,477	423,041	471,531	6,204,802	586

"Total Carcass" Condemnations

Condition	Cattle		Calves		Pigs		Sheep	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Septic conditions	301	0.036	66	0.016	704	0.149	574	0.009
Actinomycosis	11	0.001	..	..	..	..	..	..
Arthritis	79	0.009	174	0.041	1,039	0.220	3,509	0.057
Caseous lymphadenitis	..	..	..	..	..	..	2,745	0.044
Cysticercus ovis	..	..	..	..	..	..	269	0.004
Emaciation	1,968	0.233	42	0.01	40	0.008	21,114	0.340
Sarcosporidiosis	1	..	..	..	..	..	702	0.011
Tuberculosis	1,049	0.124	23	0.005	177	0.038	..	..
Other conditions	1,438	0.170	1,031	0.244	432	0.092	4,386	0.071
Totals	4,847	0.573	1,336	0.316	2,392	0.507	33,299	0.536

"Partial Carcass" Condemnations

Condition	Cattle		Calves		Pigs		Sheep	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Actinomycosis	13,024	1.540	7	0.002	..	..	..	..
Arthritis	2,653	0.314	52	0.012	3,026	0.642	8,063	0.130
Caseous lymphadenitis	..	..	..	..	..	..	14,386	0.232
Cysticercus ovis	..	..	..	..	..	..	..	..
Emaciation	..	..	..	..	..	..	..	..
Sarcosporidiosis	..	..	..	..	..	..	..	..
Septic conditions	203	0.024	13	0.003	359	0.076	208	0.003
Tuberculosis	1,313	0.155	6	0.001	683	0.145	..	..
Other conditions	6,446	0.763	110	0.026	6,513	1.381	4,245	0.068
Totals	23,638	2.796	188	0.044	10,582	2.244	26,902	0.433

Liver Conditions

Percentages of cattle and sheep livers condemned for various diseased conditions revealed by surveys at Homebush were as follow:—

	Cattle	Sheep
Liver Fluke	22.4	12.0
Hydatid disease	1.9	5.0
Cysticercus tenuicollis	—	6.8
Other Parasites	—	4.4
Telangiectasis	1.3	—
Abscesses	1.4	—
Caseous lymphadenitis	—	1.4
Multiple adhesions	1.4	1.0
Melanosis	—	1.0
Other conditions	0.01	0.05

Oesophagostomiasis (re Sausage Casings)

Surveys of damage to sheep's intestine by oesophagostomiasis showed seven per cent to be unsuitable for sausage casings.

Miscellaneous Meat Inspections

Meat from other States and New Zealand was re-inspected and branded.

All cattle were inspected prior to sale at Flemington Saleyards and prior to slaughter at the State Abattoir. All pigs sold at the Homebush Bay pig markets were inspected.

Meat Markets, Depots, Shops

Inspection was full time at the Metropolitan Meat Industry Board's Meat Markets at Homebush Bay. Inspection was part-time but regular at private depots and markets in the city and suburban areas. Shops retailing meat were inspected under the Meat Industry Act.

QUEENSLAND BORDER CONTROL

More Inspectors

Seventy-seven inspectors comprised the staff to control the introduction of Queensland cattle; 64 full-time, and 13 part-time; compared with 72 in the previous year.

Stock Movements

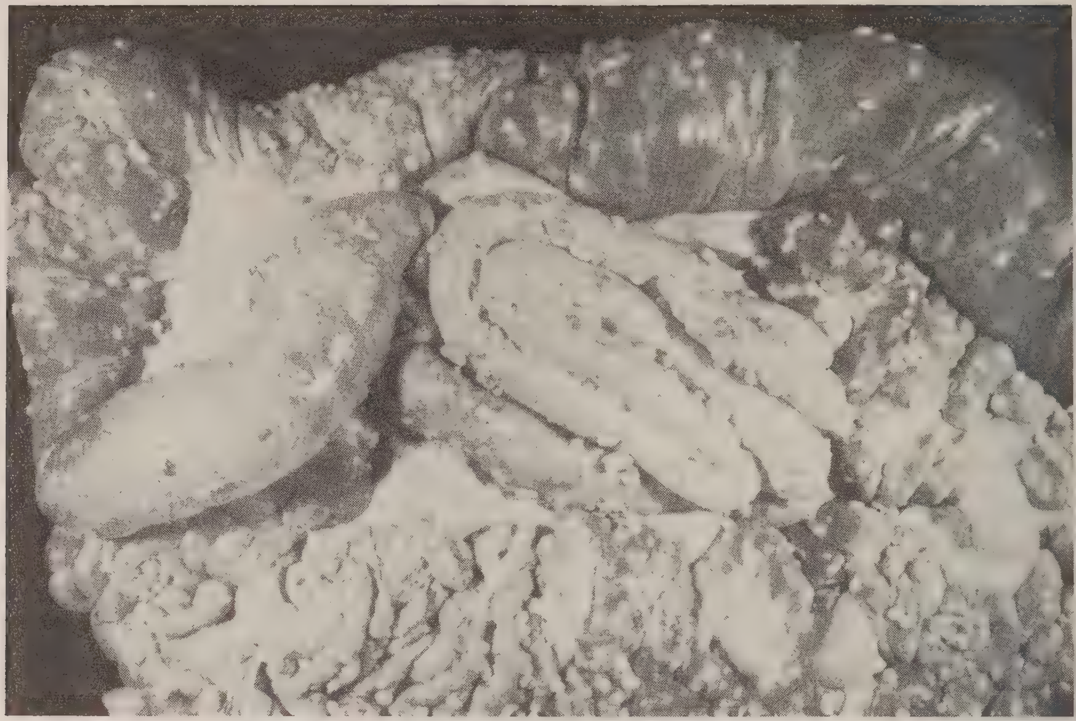
Stock moved into New South Wales comprised 333,440 cattle and 905,633 other animals; each an increase, compared with the 316,351 cattle and 751,388 other stock in the previous year. The following are particulars of the introductions in the three administrative sections:

Administrative Section	Number of Cattle	Number of Other Stock
Stanthorpe	185,928	45,815
Goondiwindi	101,353	357,146
Mungindi	46,159	502,672
Totals	333,440	905,633

Border Fencing and Tracks

In the Stanthorpe Section, tracks along the border fence were cleared and bulldozed in conjunction with the Darling Downs-Moreton Rabbit Board, to allow access by motor vehicles.

In the Goondiwindi Section where the Barwon and Macintyre Rivers form the border and are barriers to stock movements, river levels were very low because of the drought. Land owners co-operated in erecting temporary fences to prevent stock crossing.



Sheep Intestines Affected by Oesophagostomiasis

The Department's Meat Inspection Services protect consumers' interests. Surveys in the course of this work indicated seven per cent of sheep intestines to be unsuitable for sausage casings—through attack by an internal parasite, *Oesophagostomus*

ACTIONS UNDER COMMONWEALTH QUARANTINE ACT

The Division of Animal Industry continued to administer provisions of the Quarantine Act, 1908-61, on behalf of the Commonwealth Government. The work volume continued upwards, mainly because of greater use of air transport.

More Port Inspectors

The first, full-time port inspector to be stationed at Newcastle was appointed this year. Previously, the quarantine work at that centre was done by veterinary officers in conjunction with other duties. An extra port inspector was appointed to Sydney.

Inspections of Imports

Animals.—Because the parasite *Trichinella spiralis* was confirmed in pigs in New Zealand, immediate action was taken to prohibit importation of live pigs from there. All pigs imported from New Zealand in the previous 18 months were traced and brought under quarantine surveillance.

Totals for all classes of animals imported, except pigs, showed increases. Dog importations from the United Kingdom and New Zealand were the highest ever, and strained the Animal Quarantine Station facilities. Importation of cattle, sheep and goats into Australia remained totally prohibited.

Five deliberate attempts to smuggle animals in from overseas were detected.

Animal Products.—Near the end of the year a change in legislation prohibited importation of tinned pig meat from overseas, except from the United Kingdom, Ireland, U.S.A., Canada and New Zealand. Some certificates of heat treatment had been found to be unreliable.

Introduction of chilled or frozen pig meat from New Zealand was banned when *Trichinella spiralis* was discovered there. This parasite is not in Australia.

Importations of animal casings, feathers, chilled and frozen meat, fish and meat meals decreased. Importations of cheese, all types of hides and skins, tinned meats, animal hair and wool increased.

Passengers' Baggage.—During the Customs check abundant salami and other types of meat, home-made cheese and other foods of animal origin were discovered in the baggage of migrants and others arriving from overseas.

The luggage of one passenger arriving by ship contained 70 lb of salami and 50 lb of home-made cheese. A passenger arriving by air had 20 lb of bacon, 15 lb of salami and 15 lb of home-made cheese.

Illegal importations of food and other materials of animal origin constitute some of the most serious problems facing the Animal Quarantine Service. The work is growing with continued increase in passenger arrivals. In 1964-65 there were 81,950 passenger arrivals by ship and 242,684 by aircraft; compared with 54,130 and 184,763 in 1963-64.

Parcels Post.—The volume of goods subject to quarantine control, arriving from overseas by parcels post, continued to be considerable. Many food items of animal origin were seized.

Inspection of Animal Exports

Supervision over export of animals continued, involving inspection and in some cases treatment.

Cattle exports increased, mainly due to greater exports to Papua-New Guinea and to Chile. Dog exports also increased; 980 were sent to 35 different countries; 292 to the U.S.A. and 229 to Hong Kong.

Day-old chicken exports decreased; 200,000 fewer chickens were sent to Malaysia than in the previous year. The overall reduction was lessened by increased exports to Fiji, New Caledonia, New Guinea and New Zealand.

Sheep exports also decreased. There were fewer large shipments to Mexico than in the previous year.

Inspection of Vessels

All ships specially used for the carriage of livestock were examined for cleanliness and treated with an insecticide. From one vessel, trading between Australia and Mexico, dead insects were collected for identification. Among these the secondary screw-worm fly (*Callitroga macellaria*), also found on previous occasions, was the most prevalent; and some primary screw-worm flies (*C. hominivorax*) were found for the first time.

SUSPECTED RABIES

Rabies does not exist in Australia. Investigations were immediate when a report of a suspected case of rabies in a dog in a Sydney suburb was received from a medical practitioner with overseas experience. The dog was found to have died from lead poisoning. Tests showed the animal was not affected with rabies.

DISINFECTION OF FOOTWEAR AND CLOTHING

A system was introduced for disinfection of footwear and certain clothing owned by incoming air passengers, where within three months of departure for Australia there had been contact with farm animals, abattoirs or meat packing establishments.

This action was taken to reduce the risk of foot and mouth disease virus entering Australia. The risk was increased through rapid air transportation and the greater number of air travellers.

SHIPS' PETS

Increases in port inspection staff enabled stricter supervision of pets on overseas vessels, particularly at Newcastle. On a number of occasions instructions to ships' officers to tighten their precautions against escape were needed.

LIAISON WITH OTHER SERVICES

Good liaison and co-operation were maintained between the Animal Quarantine Service and the Department of Customs and Excise. A senior quarantine officer addressed customs officers at trainee schools, explaining quarantine significance and laying the basis of co-operation. Liaison was maintained also with the General and Plant Quarantine Services. Imported goods of mutual interest were referred to the other service before release.

A veterinary officer of the Commonwealth Department of Health, Canberra, spent six weeks at Sydney to observe and participate in animal quarantine duties. A quarantine officer from Darwin also observed quarantine procedure in Sydney.

Livestock Health—Research

VETERINARY RESEARCH STATION, GLENFIELD

BIOCHEMICAL ANALYSES

Chromatography work continued. It is now possible to recover simultaneously *alpha tocopherol, beta carotene* from the same process and to measure very low levels of both in feedstuffs, faeces and serum. Some problems in the analysis of liver for these and *Vitamin A* have yet to be overcome. During this work, problems of collection, storage and deterioration rate have been studied. Some results from pastures at room temperature, when exposed to circulating air, but not sunlight, are shown below:—

PERCENTAGE LOSS

Time Interval	*Alpha Tocopherol*	*Beta Carotene*
2 days	Negligible	Negligible
8 days	50%	30%
13 days	70%	50%
21 days	90%	70%
30 days	100%	80%

This situation is greatly improved by rapid drying and deep freezing within 24 hours of collection. Freeze drying under vacuum is being investigated.

BRUCELLOSIS (SHEEP)

Effects of Vaccination on Fertility and Serological Response.—The experiment mentioned in the 1963-64 Annual Report, examining the effects and efficiencies of commercially available *Brucella ovis* vaccines, was concluded. The aims were as follows:—

(*a*) To study the effect of vaccination on ram fertility, using each of the commercially available brands of *Br. ovis* vaccine, with and without the simultaneous use of Strain 19 vaccine.

(*b*) To compare for each of two methods the serological response to vaccination, by subsequent challenge with a known infective dose of *Brucella ovis.*

The two methods of vaccination used were:—

(i) two doses of *Brucella ovis* adjuvant vaccine eight weeks apart;

(ii) *Brucella ovis* adjuvant vaccine plus Strain 19 vaccine simultaneously.

Both brands of *Brucella ovis* vaccine were used. Thus there were four groups of rams, plus two groups of control rams. The rams were yearling Merinos from Trangie. There were 10 rams in each group. Unfortunately the rams were not on a constant plane of nutrition.

The only significant effect of vaccination appeared to be reduced sperm motility for up to three weeks after vaccination where Strain 19 was used simultaneously with *Brucella ovis* vaccine. One ram of the twenty that received this treatment become completely sterile from weeks 9 to 14, post-vaccination, but returned to normal by week 19, post-vaccination.

Two doses of *Brucella ovis* adjuvant vaccine eight weeks apart had no apparent effect on semen quality.

The rams gave a strong serological response to one vaccine (vaccine A), with or without simultaneous Strain 19 vaccine. When two doses of *Brucella ovis* vaccine were used, the serological response to the first dose was quite strong. This persisted to the eighth week post-vaccination with only a slight drop in titre. There was good secondary response after the second dose of *Br. ovis* vaccine.

On the other hand, virtually no serological response was given by the rams receiving the other *Brucella ovis* vaccine (vaccine B), with or without simultaneous Strain 19 vaccine. A large number of anticomplementary reactions were recorded after the second dose, in the group of rams receiving eight weeks apart two doses of this *Brucella ovis* vaccine B. In some cases these reactions lasted for several weeks.

The Efficiency of Vaccination.—A preliminary trial involving 25 Merino yearling rams showed that an approximate $(10)^9$ dose of *Brucella ovis* injected intravenously would infect four out of five rams. This dose was used to challenge the rams in the earlier mentioned vaccination experiment aimed at determining the efficiency of the vaccine and the vaccination method. The rams receiving Strain 19 vaccine and *Brucella ovis* vaccine were challenged 16 weeks after vaccination, whereas those receiving two doses of *Brucella ovis* vaccine eight weeks apart were challenged eight weeks after the second dose of vaccine. A group of 10 control animals was challenged at the same time and a further 10 control animals (unvaccinated) were left unchallenged. The results are summarised in the following table:—

Group	Treatment	Challenged	Epididymitis	*Br. Ovis* recovered
1	Vaccine A + Str. 19	10^9 *Br. ovis*	0/10	0/10
2	Vaccine B + Str. 19	10^9 *Br. ovis*	2/10	2/10
3	Two doses Vaccine A	10^9 *Br. ovis*	0/10	0/10
4	Two doses Vaccine B	10^9 *Br. ovis*	5/10	5/10
5	Control Challenged	10^9 *Br. ovis*	5/11	5/11
6	Control Unchallenged	. .	0/9	0/9

It would appear that vaccine A used either simultaneously with Strain 19 or as two doses of vaccine eight weeks apart, produced a solid immunity under the conditions of this trial. On the other hand, it is reasonable to presume from the results that the only protection afforded by vaccine B was due to the Strain 19 used—and the latter is known to give partial protection.

Diagnostic Tests.—Preliminary work is proceeding on a haemagglutination test described by N.Z. workers, and on a gel diffusion precipitin test. In each case results have been encouraging, but much more work is needed before the tests can be used as reliable guides.

Antigen is now being prepared on serum agar in Roux flasks incubated at 37°C for five days in the presence of 10 per cent CO_2. Complement is being freeze dried, sealed under nitrogen and stored in a deep freeze at —25°C.

COCCIDIOSIS (CATTLE)

As part of a pasture intake study carried out at the Agricultural Research Station, Leeton, treatment to control coccidiosis was supervised. Regular, monthly faecal examinations were made from when the project started on 22nd April, 1964, until it ended on 17th November, 1964. Oocyst counts were not very high in either group, and other clinical symptoms were absent. However, the sulphadimidine treated group gained an average of 434 lb compared with 373 lb for the untreated group over the period (170 days). A repeat of this trial was started on 4th May, 1964.

COPPER DEFICIENCY (PIGS)

Interpretation of the role of copper in pig nutrition has posed difficulties. Knowledge of variation in liver values at various ages and under differing conditions has been lacking.

Samples have been obtained from four areas, from animals of known age and diet—Wagga (50), Richmond (60), Wollongbar (81) and Newcastle (18). The pattern fairly closely follows that established by New Zealand workers. Copper levels at birth range from 150-350 ppm, steeply dropping to levels between 10 and 40 ppm at 10-12 weeks of age. This level is apparently maintained during the first twelve months. Few figures are available for after six months of age.

Copper level variation as between sampling sites in the liver may be up to 100 per cent but within the same order as the general range for the age group.

Comparing areas there are trends within these figures that probably reflect nutritional differences. For example, values from Wagga and Wollongbar after ten weeks were between 20 and 40 ppm, but those from Richmond were between 10 and 20 ppm. Relationship with diet has not yet been examined.

INFECTIOUS LARYNGOTRACHEITIS

In this laboratory, iodine in organic form (e.g., polyethylene glycol monethyl ether complex) was found to be useful in prevention and control of Infectious Laryngotracheitis. Some poultrymen have adopted this therapy. Trials are under way, and the early results are confirmatory.

INFERTILITY (SHEEP)

An experiment was carried out to further define physiological factors underlying the susceptibility of wrinkly ("Folds Plus") rams to heat-induced, temporary infertility. The programme involved 16 rams and 350 ewes. Heat treatment was applied to the scrotum of rams. This raised the intratesticular temperature to 39.5°C for 90 minutes. "Folds Minus" rams were submitted to a similar treatment. Results indicate that the resistance of "Folds Minus" rams to heat-induced infertility resides in their ability to keep their testes cool.

MASTITIS

Staphylococci from the Field; Coagulase Production.—Of staphylococci from field cases of mastitis, 44 haemolytic and two non-haemolytic were examined for coagulase production. Thirty-six of the 44 haemolytic were positive and eight were negative. The two non-haemolytic were positive.

Antibiotic Sensitivity Tests.—The results are recorded in the following table:—

Antibiotic	Staphylococci		Streptococci	
	Tested	% Sensitive	Tested	% Sensitive
Penicillin	77	71.4	30	86.1
Streptomycin	77	90.9	30	96.7
Tetracycline	74	94.6	30	100
Chlortetracycline	74	94.6	30	100
Oxytetracycline	74	95.9	30	100
Chloramphenicol	77	98.7	30	100
Erythromycin	74	94.6	30	96.7
Furazolidone	57	94.6	20	100
Spiramycin	54	66.7	20	100

The staphylococci figures can be broken down further, referring to haemolytic and non-haemolytic, as follows:—

Antibiotic	Haemolytic staphylococci		Non-haemolytic staphylococci	
	Tested	% Sensitive	Tested	% Sensitive
Penicillin	69	73.9	8	50
Streptomycin	59	89.9	8	100
Tetracycline	66	93.9	8	100
Chlortetracycline	66	93.9	8	100
Oxytetracycline	66	95.5	8	100
Chloramphenicol	69	98.6	8	100
Erythromycin	66	95.5	8	87.5
Furazolidone	53	94.3	4	100
Spiramycin	50	68	4	50

Due to poor diffusibility of spiramycin from the disc into the agar medium there was difficulty in determining whether an organism was resistant or sensitive to this antibiotic.

NUTRITIONAL STRESS (SHEEP)

Preliminary examination has been made of the importance of this problem, and to establish for diagnostic purposes and further investigations the value of biochemical measurements.

This work has been helped by studies in conjunction with field staff on "Wollogorang", on the southern tablelands. There sheep are being maintained at high densities, and low body weights. Following loss of 3,000 of 6,000 weaners last year, controlled groups were set up to define the problem more closely by reproducing the situation in weaners at different nutritional levels. This phase has been concluded. Examination of the results has not been completed.

Serum albumin levels were affected by nutritional level. Means ranged from 3.3 to 4.2 g/100 ml. in the respective groups.

Serum G.O.T. pattern indicated elevation to a mean value of 174 units per ml. in the early stages of tissue catabolism. In badly stressed groups this fell to a mean of 80 units per ml. This is taken to indicate that a level of minimum residual tissue is reached. There was correlation between body weight, total dry matter of rumen content, percentage dry matter of rumen content; and an inverse relationship with percentage nitrogen in rumen content (only nine determinations). There was an apparent association between percentage nitrogen in liver and the copper content. Each increased as nutritional state deteriorated.

PARASITES—EXTERNAL (SHEEP)

The efficiencies of various chemicals and combinations of chemicals against lice, keds and itch mites were studied. Changes in concentrations due to hydrolysis and stripping were measured with the co-operation of Division of Science Services. The trials of lime sulphur mixed with four different organophosphates were concluded. These have been reported in a paper shortly to be published.

PARASITES—INTERNAL (CATTLE)

The Australian Cattle and Beef Research Committee has provided funds for studies of the epidemiology and methods of control of internal parasites in cattle. First phase, field investigations started in October, 1964, on Departmental and private properties throughout the State. This initial or survey phase will determine the incidence and abundance of internal parasites in cattle from birth to two years of age, in various climatic and management situations. Regular faecal examinations at the Glenfield Station will indicate fluctuations in worm parasite numbers in samples from groups of cattle on selected properties.

Attention has been concentrated so far on the far north coast area where Departmental herds at Duck Creek (Ballina) sub-station of Wollongbar Agricultural Research Station, and the dairy herd and the beef herd at Grafton Agricultural Research Station are under observation.

PARASITES—INTERNAL (PIGS)

At the Wollongbar Station the anthelmintic efficiency of thiabendazole against *Hyostrongylus* and *Oesophagostomum* was measured. Planned observations were made on incidence and effects of pure infections by various species, in different management situations.

PARASITES—INTERNAL (SHEEP)

Worm burdens and their effect, on sheep grazing at a high stocking rate in small paddocks and frequently moved, are being studied. The drought and a heavy mortality from *Phalaris tuberosa* poisoning have dislocated the experiment.

Anthelmintic and toxicity trials of tapeworm remedies have been conducted. Generally, lead arsenate proved efficient at 1/10 gm/4 lb B.W. Stannous arsenate was fully efficient at a dose rate of 250 mg. per lamb. No significant growth rate gain was recorded as a result of treatments.

A number of new compounds were examined and tried on small groups of sheep. Results of other trials in progress are not yet available.

PULLORUM DISEASE (POULTRY)

Pullorum testing in the field is extensive. Interest was directed to problem flocks wherein positive reactions were obtained after an "apparently clean" test or where reactor incidence was previously low. These reactors were examined by the tube test, culture from eggs, liver, gall bladder, ovary, oviduct and faeces. Most of these problem, positive reactors were shown to be apparently negative for *Salmonella pullorum* in eggs and tissue. One bird, repeatedly negative to test, consistently excreted the organisms by egg and the organisms were later recovered from tissue.

Discrepancies were found between different commercial antigens, on selected reactors. In general, the antigens detected the same positives but reaction-intensity results varied.

Possible effect of furazolidone on the pullorum test is being studied in a trial. As yet no interference has been found, using the whole blood test on known reactors over a period of two months from administration of the drug. The effect on transmission of the organism to the egg is under investigation.

SWINE FEVER

Four Strains Now Held.—Transmission was undertaken with material which was received in 1961 and 1962 from several properties but not examined at that time. A swine fever virus was recovered from pig tissues from one of these properties. This is the second known isolate of a New South Wales strain of swine fever virus. It has yet to be compared with the original agent recovered in the 1961 outbreak.

A strain of virulent virus from the 1942-43 swine fever outbreak was found to be still infective after nineteen and a half years in storage as desiccated liver in sealed glass ampoules held in a refrigerator (4°C.).

Four strains are now held at this Glenfield Station; the "Weybridge" (U.S.A.) strain, used for challenge work; two isolates from the New South Wales (1961-62) oubreak; and a strain from the 1942-43 outbreak.

Gel Diffusion Precipitin Test.—Of 1,927 sera examined routinely, 80 gave positive reactions for swine fever antibodies. Also, 1,620 pig sera were obtained, from 18 abattoirs throughout the State. The results of this survey are incomplete, but an overall 6 per cent reactors has been obtained. This compares to 6.97 per cent reactors in a similar, 1962-63 survey. Only eight cattle sera were submitted to test during the year. Three were positive.

VIBRIOSIS

Rendering of culture media suitable only for *Vibrio* continued under investigation. Various antibiotics, alone or in combination, have so far failed. Most of the difficulty is caused by other Gram-negative organisms, especially *Proteus* and *Pseudomonas* species.

During antigen preparation work an affinity of *Vibrio fetus* for glass was observed when inoculated broth was undisturbed for more than two days. The *Vibrio* growth simulated that of algae. Long strands appeared firmly attached to the bottom of the glass. This growth contained a large proportion of long filamental *Vibrio* forms. These proved unsuitable for antigen production. Gentle, flask shaking for a few seconds daily prevented such formations. The organisms then proved satisfactory for antigen production.

Stored antigen checking continued, as planned in January, 1963. A batch of *Vibrio fetus* antigen after 29 months in the refrigerator without addition of any special preservative was checked against fresh antigen and still satisfactory.

The possible value of fluorescent antibody techniques in vibriosis investigational work will be further examined. They seem unlikely to aid differentiation of intestinal and venereal strains of *V. fetus,* but might help to detect carrier bulls.

VIRUS ABORTION (SHEEP)

Two groups of ewes two to three months pregnant were challenged with the PLGV (Psittacosis-lymphogranuloma venerum) agent isolated in eggs. Of 20 ewes challenged only one aborted, 10 days before term, and a PLGV agent was recovered from the lamb. This ewe was one of two intravenously inoculated. Another ewe, one of two intraperitoneally injected, bore a live lamb but there were elementary bodies in foetal membrane smears. The remainder, either *per os* or subcutaneously inoculated, lambed normally.

Some ewes had pre-challenge positive titres to the PLGV complement fixation test but these, like most of the ewes, had a post-inoculation rise which persisted up to six weeks.

It would appear that the organism in this instance was of low virulence, compared with U.K. and U.S.A. results for organisms of virulence comparable to Stamp's isolate.

CATTLE TICK RESEARCH STATION, WOLLONGBAR

LARVAL TICKS

Longevity.—Further observations were made on longevity of colonies of larval *Boophilus microplus.* The previously en-encountered longest life for a population has not been exceeded. The period from female parent dropping, to disappearance of the last larva, was defined in 1963-64 and remains at 224 days.

Migration.—*Boophilus microplus* larvae travel much further than was previously recognised. In November, 1964, a few larvae which had their origin in eggs from 500 females exposed on 19th August, were found 25 feet from the point of hatching. They had moved uphill on a north-eastern slope exposure, presumably with the prevailing north-easterly breeze. An exposure on 11th November produced larvae on the grass on 27th December. Within a week the most distant migrants from the exposure point were 50 feet away. Movement of over 40 feet was proved for approximately 1 in 10,000 of the population.

The main movement is believed to have been due to groups of larvae being blown from the tips of fluttering grass leaves to the ground, or to the grass a few inches away. Such larvae would climb again and the process be repeated.

All populations of *Boophilus* larvae found over 30 ft. from the centre are small in numbers.

Further observations were made on movement of larval populations on:—

(1) short grass resembling natural pasture;

(2) long *Paspalum dilatatum,* ungrazed for two years;

(3) an area of heavy weed growth, shaded by tall trees;

(4) a shaded area, with tall sparse grass.

On short grass, 0.02 per cent of larvae were found to have travelled as far as 57 feet, and a few were traced as far as 80 feet. Four larvae were captured in the air 1½ feet above the ground, indicating the possibility of extensive windborne spread.

On long grass, similar dispersal took place. Here, the larvae were thought to travel mainly via the mobile leaves on the surface of a dense body of straw some 18 inches deep.

On the other two sites, travel did not exceed 15 feet, presumably because wind near the ground surface was much reduced. However, some larvae had ascended tree trunks to a height of 7 feet. These findings are of practical value. In the past, infested and clean areas have been considered safely separated by 12′ buffers.

EFFICIENCY OF ACARICIDES

Sevin.—A dip was charged with this material at 0.25 per cent w/v and an attempt made to maintain the concentration of 0.2 per cent w/v by topping the bath. This resulted in a hair loading approximating 20 mg per gramme. At another dip, where both a higher concentration and a higher topping rate were employed, the hair loading was only 15 mg per gramme. Ageing and polution of dipping fluid appeared to depress the loading on hair, even at higher concentration in the bath.

Banol (*6-chloro-*3, 4 *xylylmethyl carbamate*).—This experimental acaricide was tested in a spray race. At a concentration of 0.5 per cent w/v it was promising. Eighteen per cent of the adults dropped on "day one" laid viable eggs. A mean of 0.25 adults per right side was counted at 10 days after dipping. Residual protection against larvae approximated nine days.

Chlorfenvinphos.—This organic phosphate formulation, shown by CSIRO workers at Yeerongpilly to be effective against denav-resistant strains of ticks, was tested at 0.075 per cent a.i. in a spray race. During the first seven days after treatment 250 adults were collected. Of these, 7 per cent laid viable eggs. In the 7th to 14th day period, 62 ticks were collected. Of these, three laid viable eggs. Examination of 12 field animals revealed a total of 225 adult ticks on the right sides of the animals 13 days after treatment. Ten animals ethion-treated under similar conditions showed a total of 40 adults of the same stage. Therefore, although chlorfenvinphos shows promise as an efficient acaricide, it does not seem to be superior to ethion.

Stirring of Dips

In the spring of 1964 an efficient mechanical stirrer became an urgent need, because of cattle mortalities and resultant objections to using cattle as stirrers. By experimentation a device was perfected. In mass production it costs £2 per unit. It allows two men to stir a dipping bath in less than 10 minutes. Mortalities, mentioned in the previous paragraph, took place when a few baths of the most generally used acaricide unexpectedly caused hundreds of cattle to suffer organic phosphate poisoning. About 100 died. Investigations failed to explain the phenomenon. But the toxic baths had remained unused for many months and had taken on some features of double-strength dips.

Comparison of Spraying and Dipping

To compare the efficiency of spray-race treatment with dipping, an extensive trial was designed. Forty heavily infested animals were used. Sixteen were sprayed, sixteen dipped, and eight left untreated as controls. For each treated group, the acaride was 0.077 per cent w/v ethion. After treatment, cattle were examined for three weeks. Results are set out in the following table, with the figures in parenthesis representing the percentage of total ticks laying viable eggs:—

Treatment	Ticks Recovered at Intervals, Post-Treatment		
	1-7 days	7-14 days	14-21 days
Sprayed animals in covered stalls (2 head)	5,712 (23%)	48 (54%)	47 (73%)
Dipped animals in covered stalls (2 head)	2,174 (11%)	9 (45%)	6 (50%)
Sprayed animals in open stalls (4 head)	9,140 (21%)	92 (67%)	113 (67%)
Dipped animals in open stalls (4 head)	7,387 (21%)	23 (83%)	22 (73%)
Untreated controls (2 head)	12,117 (96%)	6,673 (97%)	7,773 (98%)

As the figures show, the spray-race treated animals dropped more adults but also a higher percentage of the ticks dropped laid viable eggs. On the sprayed animals most surviving ticks were found on the head, the top of the neck, and under the butt of the tail.

Acaricide Resistance

When poor tick control on a property was reported, adult female *Boophilus microplus* were collected from the herd. Tests by dunking were done on larval progeny, to compare their delnav susceptibility with that of the known susceptible Wollongbar strain. The strain did not differ from the Wollongbar strain in its susceptibility to delnav. These results were confirmed by the CSIRO Division of Entomology. Organic phosphate-resistance had not caused the failure of control.

Effect of Rain Following Treatment

A simple, effective method of applying one inch of rain per hour to animals held in a draining pen has been developed. A trial was conducted to assess the effect of this rainfall on the tick burden of animals dipped in a solution of sevin.

Forty-two animals were used in this trial, in five groups, Group A received one inch of artificial rain an hour after dipping; Group B, one inch twenty-four hours after dipping; Group C, one inch seventy-two hours after dipping; Group D, no rain, but held in covered stalls for collection of all falling ticks; Group E, no rain, but run in the field. Also, two animals were stalled as untreated controls.

In no Group did the rain have any effect on kill of ticks that were adult at the time of treatment. But in the groups receiving rain at one hour and 24 hours after dipping, more nymphal stages moulted through to adults than in the other groups. In all groups, the protective period against larval re-infestation approximated nine days.

Babesiosis (Tick Fever)

Some 16,000 blood samples were tested, for *Babesia argentina* and for *Babesia bigemina*.

Difficulties occurred in producing the antigen and the complement.

Antigen production was hindered because a large proportion of calves died before demonstrating an adequate parasitaemia. These calves had been brought in north-western New South Wales, in an attempt to provide animals free of *Thieleria mutans*—common in the blood of coastal calves.

A method to eliminate *Thieliera* from the blood of local calves at a certain stage has now been developed. Primaquine diphosphate is used. As a result, local calves have been used successfully for *B. bigemina* antigen. Massive doses of terramycin have been used to eliminate *Eperythrozoon* from the blood of calves to be used for the production of *B. argentina* antigen.

The difficulty in complement production has been that of securing enough guinea pigs.

BOARD OF TICK CONTROL RESEARCH LABORATORY

Dip Toxicity Factors

After serious mortalities in cattle dipped in delnav at two Copmanhurst dips the fluid from one of these dips was brought under experiment. The aim was to test the effect of holding the wettability of the bath, observing the change in depositing power as wettability was increased. This was done because it was thought that depositing power of the bath was related to toxicity and also to wettability of the bath.

The experiment indicated: (i) that although addition of wetter to a laboratory sample increased wettability, inexplicably the addition of wetter to the actual dip did not proportionately increase wettability; (ii) increasing the wettability of a dip did not decrease the hair deposit, except on the underline—where averages were depressed progressively 4.5, 3.2, 2.7 mg/gms. delnav per gm. of hair as wettability of the dip was increased.

A further experiment was conducted to test the various batches of delnav used in dips where high, hair deposits have caused mortalities. This work showed that large, emulsion particles cause heavy settling out, greater depth of bottom sludge, and lower the concentration of the supernatent fluid. The two dips where higher mortalities occurred were charged from the one delnav batch. This when tested showed a bottom sludge of 4½ and 5 ml. respectively; considerably greater than for other delnav batches—the highest of these was 2 ml.

Mud's influence on delnav deposition was investigated in the laboratory. Dip strength was kept constant at 0.075 per cent delnav and the various amounts of mud were weighed and added to the dip emulsion. Glass slides which had a minute film of grease were dipped in the suspension for three seconds, allowed to dry, and the deposit of delnav was determined. The results indicated that as time increased, delnav deposit increased; and as mud increased past a certain point, delnav deposit decreased. However, despite precautions to control the conditions of the experiment, the results shown were erratic. This is typical for delnav, as shown in previous similar experiments.

Field observations have shown that the level of delnav deposited on the hair can vary widely. There is no explanation for this. It occurs in dips which have lain idle for several months but this is by no means always the cause. There is a suggestion that the emulsion breaks, giving a delnav-mud mixture; that this mixture prevents re-coalescence of delnav, but contains not enough mud to dilute the delnav to a non-toxic deposit.

Tests with Acaricides

Sevin.—Its hair loadings are very viable; some as high as 40-50 mg/gm., others as low as 4 to 5 mg/gm. of hair. They are so viable that an average would not give a true picture. A median is a better representation. The following medians have been calculated. A dip charged with 0.168 per cent sevin could be expected to deposit approximately 0.33 mg of sevin per gm if no stripping took place; as sevin actually deposits 15 mg/gm of hair, a stripping factor approximating 5 could be claimed.

Asuntol.—Previous work suggested that to maintain a dip at 0.025 per cent, a topping up rate of 1:200 would be needed. Further observations have suggested that a 1:250 rate is more appropriate.

Effect of Scooping Dips

Some of the dipping baths charged with delnav were surveyed, to estimate the effect of scooping. Eleven Kyogle dips and nine in other areas were selected, all recently scooped.

In this survey the dip strengths after scooping were shown to have increased from an average of 0.077 per cent to an average of 0.091 per cent in the Kyogle area and from 0.073 per cent to 0.094 per cent in the other areas. Contrary to expectations that scooping would remove insecticide, and thus lower the concentration of the bath, the extra stirring caused by scooping more than compensated for loss of medicament.

EFFECTS OF STORAGE ON ACARICIDE CONCENTRATIONS

Samples of six acaricides were stored for from 15 to 27 months and analysed at intervals. Neocidal and sevin showed gross depletion. Trithion, asuntol powder, asuntol liquid, and ethion remained relatively constant.

EFFECT OF STORAGE ON LEVELS OF DELNAV IN FAT

Decomposition of delnav in stored fat samples under normal refrigeration was investigated by analyses. The animals were killed on May 8 and 11, 1964, and the samples brought to the laboratory and placed in the deep freeze. This kept the samples at about minus 6°C. Analyses were completed by June 4, 1964, and the samples were removed from the deep freeze to the refrigerator where temperatures were in the range of 4°C to 6°C. The samples were held at this temperature until analysed a second time six weeks later.

For five of the six samples the figure was lower for the second analysis. Thus it is reasonable to conclude that some delnav decomposition does occur in samples.

Decomposition rate of delnav in the fat was not as high as suspected, but higher temperatures might increase this rate. It would therefore be advisable to keep samples under deep freeze conditions until analysed.

ANALYTICAL METHODS RESEARCH

Ethion.—All the known methods for extracting micro amounts of ethion from fats of animals were extensively tested. The work showed that no clean-up using columns or even filtering on filter paper is adequate, because of serious loss of the insecticide—especially when working in the 1 part per million range.

Asuntol.—Preliminary trials indicated the possible estimation of asuntol in small amounts; by extracting the fat from a petroleum ether solution with acetonitrile, evaporating the acetonitrile and taking up the residue in alcohol and, using a different spectra technique, determine the asuntol by ultra violet spectroscopy.

This was tried with beef fats. It appeared quite successful on the several beef fat speciments. On mutton fats, a variable interference crept in. This was identified from text book spectra as ergosterol. It gave rise to absorption very close to that of asuntol in the ultra violet, giving false and variable positive readings. Therefore a form of clean up became necessary.

Livestock Husbandry—Field Activities

SHEEP AND WOOL SECTION

EXTENSION SERVICES

Statistical.—The following is a summary of activities, comparing 1963-64 and 1964-65:—

	1963-64	1964-65	Percentage increase or decrease
Number of property visits	2,904	2,014	— 37.0%
Number of sheep ranked on production	(New policy)	192,732	..
Value of sheep selected and purchased	£146,822	£122,607	— 17.9% (seasonal)
Lectures, Demonstrations and Field Days	277	226	— 18.4%
Ram Sales, Agricultural Shows, etc.	126	110	— 12.7%
Radio, Press and TV	447	428	— 4.2%
Competitions judged	36	29	— 19.5%
Field Investigations	29	41	+ 41.6%

The decrease in property visits, lectures, demonstrations, etc., radio, press and TV reflected four vacant Districts, and one District occupied by an officer for only the latter part of the year.

Use of Television.—A new development in sheep and wool industry extension work was use of Orange and Wagga television stations. Sessions appropriate to this medium were planned and presented by sheep and wool officers.

Field, Investigation Projects.—Most of the District sheep and wool officers organised field projects in co-operation with the Wool Research Laboratory, Trangie Agricultural Research Station. Demonstration units, in particular dealing with high stocking rates, were organised with co-operative graziers in all Districts.

Drought, Husbandry Advice.—The drought over most of the State for the last six months affected extension advice on normal management procedures. Concentration was on drought, husbandry techniques and hand feeding.

Breed Competitions.—The Merino ewe competition continued, on the same basis as in the previous year.

The sheep breeding ewe fertility competition, commenced in 1964, has been difficult to establish. This was due to the producer effort required by the conditions, regarding detailed mating and lambing records. The competition has shown lambings of 160 per cent on commercial properties. This year the competition conditions were extended to include Merinos, whereas it was previously limited to crossbreds. If support is sufficient, a separate Merino section will be organised.

Local organisations' competitions of sheep and carcass character, were judged by officers within their own Districts.

Extension Liaison with Other Bodies.—The Junior Farmer Movement was assisted by lectures, demonstrations, and competition judgings.

Periodic visits were made by the sheep and wool officers to the Mannus Re-Afforestation Camp, Tumbarumba, to advise on management and husbandry of the flock.

FLEECE MEASUREMENT SERVICE

This service is provided by three officers, and supported by funds from the Australian Wool Board. No expansion of the Service occurred this year. Prior to 1965, samples for "processing" came at a satisfactory rate, but the drought which developed from late summer led to a considerable drop in number of samples. Samples "processed" did exceed 4,000, from 104 studs.

IN-SERVICE TRAINING

Sheep and wool officers attended the following training courses: Extension Methods Training School, 5 officers; Farm Management Course, 6 officers; Lamb Grading Course, 12 officers; Commonwealth, Refresher Course, 3 officers; and all officers attended the annual seminar on sheep production organised by the CSIRO.

PRODUCTION TRENDS

Heavy Stocking.—In pasture improved areas, interest in high stocking rates now predominates. Throughout the State, there are some commercial units of wethers, varying in total from 300 to 3,000 per unit, stocking at up to 7 per acre. Such units comprise approximately 10 paddocks. The system, with a few exceptions, has not been adopted for prime lamb production or breeding flocks.

Although some research work has shown that set stocking will yield better results than rotational grazing, producers still prefer the rotational system.

Spring Lambing. This practice has been under reference in the last four Annual Reports. It has been generally adopted in the industry. As a result, shearing times have been altered. The trend is towards autumn shearing. This fits into the spring lambing management routine better than does the late winter-spring shearing.

Sheep Breed Trends.—With the opening of Moree abattoirs, increased interest there in breeding crossbred lambs is reported. Mating of Merino ewes to Border Leicester rams has increased; with graziers mating aged ewes, and mixed farmers mating all ewes, to Border Leicester rams.

Production of prime lambs by use of Dorset Horn rams and crossbred ewes is still expanding on the northern tablelands, traditionally a fine wool area. Opening of the Guyra abattoir is no doubt interesting local producers in prime lamb production.

Wool Clip Data.—Estimates of the forthcoming wool clip, the number of sheep and lambs to be shorn, were compiled for the Commonwealth Bureau of Agricultural Economics.

BEEF CATTLE, HORSES AND GOATS SECTION

EXTENSION SERVICES

Statistical.—The following is a summary of activities:—

Radio broadcasts	45
Telecasts	5
Meetings	56
Conferences	22
Schools for cattle raisers	3
Field days	51
Cattle judging	16
Farms visited	587

Press, Publicity statements—many (count not available)

Additional Agricultural Extension Grant Demonstration.—One demonstration has been approved by the Department under the provisions of this Grant. The earlier established demonstrations are still under way but have been hampered by drought. The demonstration in the Goulburn district is unfolding an excellent story.

Beef Cattle Breeders' Competition.—This proceeded for its 13th successive year. Entries totalled 181. The competition was judged in "Districts" and the winner and place getters were chosen from "District" winners. A Sydney daily newspaper referred to this competition as the largest of its type in the world. The competition has created excellent public relations, provided good experience for the beef cattle officers who do the judgings, and excellent extension opportunities at the numerous field days associated with the dispersed judgings.

The competition is sponsored by the Rural Bank of N.S.W., in association with the Agricultural Bureau of N.S.W. and this Department.

Liaison with Numerous Bodies.—Officers of the Beef Cattle Section are, by invitation or nomination, members or advisers of numerous committees and organisations concerned with matters of beef cattle production, extension and research. These include Show Societies, Junior Farmer Clubs, the Research Programme Committee (Beef Cattle), the Technical Sub-Committee on Beef Cattle Production, the North Coast Cattle and Beef Research Liaison Committee, and the Research Committees framing and directing projects on Agricultural Research Stations.

Beef Cattle Improvement Project

The Beef Cattle "Improvement Through Breeding Methods" project, centred on Trangie Agricultural Research Station, has been in operation for two years.

The first draft of young Angus bulls have completed their feeding programme and been assessed. Six of the bulls were retained as sires in the Project; five for use and one as reserve. The 22 others were auctioned at the Station in August, 1964. All were sold, and grossed almost £5,000. About 80 people attended the sale.

The second draft of young bulls are now being assessed.

Exhibit Cattle and Horses

At the 1965 Sydney Royal Show, the Department exhibited three Poll Shorthorn bulls, four Angus bulls and nine Arab horses. Of the beef cattle, one Angus bull (Trangie Eclipse) gained a Third.

At the stud bull sales held at the Sydney Royal Show, although the market was severely depressed by the adverse season, two Angus bulls were sold for 300 guineas each.

The Department's Arab horse exhibit did well in the competitive exhibits. Notable awards were won. First for stallion two years and under four went to Delos, of Wagga Agricultural College. Delos also became Champion Arab Stallion. The mare Calypso, also from this College, received the award of Reserve Champion Arab Mare. Two Seconds and Three Thirds were also achieved by the Department's Arab horses.

Beef Industry Trends

The drought has emphasised for many the value of advisory services available from Departmental field staff.

Exotic cattle breeds and their crosses have performed with merit, compared with British breeds, in the north coastal areas.

There is increased appreciation of the value of bulls that measure up to required British breed specifications, and of pure or near pure exotic breed bulls, compared with readily available crossbreds.

Abnormal prices for good quality beef cattle for slaughter have turned some attention towards lot feeding. In the short term it may be profitable, provided capital investment is minimised so that the operation could be ended at short notice.

The beef cattle industry on coastal and adjacent areas is showing enormous interest in tropical legumes.

Commercial beef cattle breeders have become more aware of the value of weight scales in their business. Increasingly producers are installing their scales. This is an encouraging response to advocacy by field advisory staff.

The flood of inquiry regarding drought feeding and management of beef cattle has been met in part by one day, drought-feeding schools in the worst affected areas. These have been very well attended.

PIG SECTION

Pig Industry Trends

Production of pig meats increased, a result of a year of very satisfactory price levels. There is no evidence that the restrictions on the movement of pigs through saleyards affected pig production generally.

The last available pig population figures (March, 1964) indicated an increase of 2,000 brood sows. The number of piggeries breeding pigs had also increased by about 200. When the figures as at March, 1965, are available a further marked increase in number of holdings carrying pigs and in the number of brood sows will show. There is also a trend to larger breeding herds.

Although production has increased, the supply of bacon pigs has at no time been plentiful. Much of the increase has been as fresh pork.

Restrictions on importation of pig meats from New Zealand helped towards more favourable returns to pig raisers.

Departmental Herds

Large White, Berkshires, Tamworth and Landrace breeds were maintained at Hawkesbury and Wagga Colleges, and Wollongbar and Grafton Agricultural Research Stations. The first two herds named were mainly for student instruction and ration purposes. The Wollongbar and Grafton herds were used for research into nutritional problems and for dissection studies.

New bloodlines were introduced to the Hawkesbury, Grafton and Wagga herds, and a programme of culling the aged sows was followed.

For £14,710, a total of 1,064 pigs were disposed of. Sales of stud animals increased and more pigs were marketed. Fewer pigs were taken for antigen research, dissections, and rations.

Extension and Regulatory Services for the Pig Industry

Statistical.—The extension and regulatory activities of livestock officers of the piggery section are shown in the following table, with comparisons for the preceding three years:—

	1961-62	1962-63	1963-64	1964-65
Farms visited	1,299	1,188	1,380	1,707
Meetings attended	63	38	52	61
Pig sales attended	242	165	169	189
Field days attended	35	21	14	17
Bacon factories and abattoirs visited	199	102	74	101
Research station visits	106	55	85	58
Shows attended	17	12	21	19
Lectures and demonstrations given	72	73	64	82
Swine Branding Act (1940) inspections	247	79	61	47
Stock Food and Medicine Act inspections	13	13	14	..
Publicity statements	*N.A.	*N.A.	41	54
Radio and television	60 (R)	56 (R)	83	72
Herd valuations (Swine fever)	79	26	..	.

* N.A. % not available. (R) % Radio only.

Help to Other Departments and Organisations.—Technical advice was given on management of pig herds maintained at institutions controlled by the Departments of Prisons, Health, Education and Child Welfare. Breeding stock were supplied to these institutions as required.

The Department of Technical Education was also assisted through part-time teaching in the correspondence, pig-raising course.

The services of livestock officers were called upon by many organisations; including the Junior Farmer Club movement, the Australian Pig Society, the Royal Agricultural Society of New South Wales, numerous country show societies, the Rural Bank of New South Wales and the Commonwealth Development Bank.

SWINE COMPENSATION ACT

No total herd was destroyed on account of Swine Fever. Expenditure from the Swine Fever Compensation Fund decreased considerably. The position of the fund at June 30, 1965, was:—

	£	s.	d.
Balance in fund at July 1, 1964 ..	93,105	8	6
Receipts for 1964-65	63,878	0	0
	156,983	8	6
Expenditure for 1964-65 ...	6,511	3	8
	150,472	4	10
Less repayment of advance to Treasury	50,000	0	0
Credit balance as at June 30, 1965	100,472	4	10

SWINE BRANDING ACT

Regulatory work continued under this Act. Some court proceedings were undertaken, successfully.

The Index to Brands issued under this Act has been completed and distributed to all officers associated with the marketing and health of pigs. The Index has proved most useful in country areas where diseased carcasses have been found at abattoirs. Tracing the pigs back to farm of origin is now undertaken on a local basis.

IN-SERVICE TRAINING

All junior officers attended as part of their training, the school for pig raisers, re-introduced and held at Hawkesbury Agricultural College after a lapse of three years. The school was most successful and greatly appreciated by the 40 farmers who attended from many parts of the State.

POULTRY SECTION

EXTENSION SERVICES

Statistical.—The following figures briefly indicate the activities of extension officers during the year:—

Farms and hatcheries visited	1,181
Field days and demonstrations	11
Visits to Government farms	23
Meetings attended	12
Articles to rural and industry press	34
Radio broadcasts	18
Television appearances	7
Lectures and symposia	5
Poultry schools	1

Poultry officers maintained close contact with producers through farm visits and participation in meetings, lectures and demonstrations. Full use was made of all extension media including radio, television and press releases. Advice was provided on all aspects of poultry husbandry.

Quarterly "Poultry Notes".—This periodical was published quarterly. The contents received a wide usage, direct by farmers and through the rural press.

Annual, Turkey Raisers' School.—The 13th Annual, Turkey Raisers' School was successfully conducted at Wagga Agricultural College, with sixty-five attending from five States of the Commonwealth.

Annual, Poultry Farmers' Field Day.—The annual poultry farmers' field day was conducted at Hawkesbury Agricultural College. Attendance exceeded a thousand. This is a major event in the poultry industry calendar and provides close association between farmers, commercial firms and this Department.

Liaison with Other Institutions.—Liaison was maintained with other Government Departments and agencies, including Education, Prisons, Aboriginal Welfare Board and the Commonwealth Development Bank.

RANDOM SAMPLE TESTS

Random sample tests by this Department continued to receive the support and interest of all sections of the poultry industry. The tests provide comparative measures of the performances of commercial strains of stock.

The 12th Random Sample Layer Test concluded in December, 1964, and the 13th was commenced—with 24 commercial participants, including one from interstate.

The 5th Random Sample Broiler Test was conducted, with 12 commercial entries. Results showed improvements in growth rate and feed conversion, compared with the previous test. The 6th test was commenced—with nine commercial entries, including one from Tasmania.

The 2nd Random Sample Turkey Test was conducted at Wagga Agricultural College, with entries from five turkey breeders. Results showed improvements in growth rate and feed conversion, compared with the 1st Test in 1961.

POULTRY INDUSTRY TRENDS

The drought adversely affected water supplies for poultry, in some areas; also feed prices and availability. The situation was aggravated by the expansion in stock numbers. Feeds, particularly protein meals, may be in short supply during the next year.

Egg Production.—Commercial egg production increased by about 14 per cent over that of 1963-64. The trends to greater intensification and automation continued. Although the number of farms decreased, the total of birds increased. The tendency to larger flocks is demonstrated by figures showing that the number of farms with less than 5,000 birds declined by 625 and flocks containing 5,000 or more increased by 43, compared with the previous year.

Increased production and weaker overseas markets caused the nett return to producers to fall from 43.5d. per dozen in 1963-64 to 39.2d. per dozen in 1964-65.

An increase in interstate trading by large farms has seriously threatened organised marketing in New South Wales.

The Council of Egg Marketing Authorities plan, involving a stock tax to replace the present pool system, will be implemented from 1st July, 1965.

Meat Production.—Meat chicken production continued to expand. It is now a specialized section of the poultry industry. New South Wales production is now estimated as exceeding 20,000,00 birds annually.

Improvements effected in nutrition, breeding and management have resulted in increased growth rate and lower feed conversion figures. Chickens are now slaughtered between 8 and 10 weeks of age with an average liveweight of 3-3½ lb and a feed conversion of from 2.5 to 2.7:1.

Returns per bird continued to decline. This is partly responsible for the increase in size of existing plants.

Demand has been constant for chicken meat. It competed favourably with red meats.

Turkey meat production expanded. Adoption of breeding programmes by leading hatcheries was reflected in improved turkey performances.

Increased interest is being shown in duck raising, and production is expected to expand.

APICULTURE SECTION

EXTENSION SERVICES

Regional, beekeepers' schools and field days were conducted; also the annual Beekeepers' School at Hawkesbury Agricultural College.

Apiary officers made good use of agricultural journals, industry journals, newspapers, radio and television as means of extension.

Increased enquiries were received about use of bees for pollination purposes, and the effects, on bees, of agricultural chemicals used to control pests.

Drought caused numerous enquiries from beekeepers wishing to feed their hives with honey or pollen substitutes.

Full co-operation was maintained between departmental apicultural officers and beekeepers' organisations, amateur and commercial.

QUEEN BEES SUPPLY

Demand for queen bees from the main Departmental apiary at Hawkesbury Agricultural College has been the greatest ever. Selected stock from a recent importation, as well as those bred from lines maintained and developed by artificial insemination, were made available to honey producers.

Bee Diseases

Incidence of American Foul Brood disease (*Bacillus larvae*), the most serious bee disease in N.S.W., has been the lowest for many years. Apiculture Branch has encouraged beekeepers to examine their hives regularly and report suspected outbreaks.

The New South Wales lead in introducing a Bee Diseases Compensation Scheme for this disease has since been followed by some other States.

Bee Industry Trends

Production and demand for honey were only moderate. The price to producers was influenced by the movement of honey to N.S.W. from other States. Much of the honey produced in northern New South Wales was obtained by packing organisations in Queensland in the spring, when conditions were generally good. It was later released on the Sydney market when conditions in N.S.W. had deteriorated.

The wholesale price of honey fluctuated between 8d. and 14d. per lb, with quality and demand.

Livestock Husbandry—Research

SHEEP INDUSTRY RESEARCH; TRANGIE STATION

Breeding Merino Sheep for Production

The Experimental Flocks.—Observations continued, using a further drop of 15 months-old ewe progeny. Results from the single character selection groups again demonstrate the high heritability of fleece weight and its component measurements. Important genetic associations are apparent between high fleece weight, broad crimping wool and long staple length. Skin fold and body weight are relatively unimportant. Selection for increased skin fold was associated with decreased, clean scoured yield, staple length and clean fleece weight.

The comparison of commercial type breeding plans shows the Selection Demonstration Flock (selection on measured characteristics) producing 8 per cent more clean wool than the registered stud (selection by traditional methods). The Selection Demonstration Flock also has major advantages in heavier body weight, longer staple length, freedom from skin fold, and superior reproductive performance. One section of the stud produced only 6 per cent lambs born, due to ram infertility.

Overall lambing performance in 1964 for 2,650 ewes joined was 107 per cent born, 93 per cent marked and 89 per cent weaned. Comparing individual flocks, the major point of interest was the poor performance of "Folds Plus", probably associated with heat stress of rams during the severe heat wave in January, 1964. The Fertility Flock had an excellent performance, with 94 per cent wet ewes and 112 per cent lambs weaned. The Selection Demonstration Flock also had an outstanding performance with 119 per cent lambs weaned. Nearly two-thirds of the ewes lambing in this flock produced twins or triplets.

Evaluation of the South Australian Merino.—The strong wool strain has shown much promise as a heavy cutting sheep for the plains of New South Wales—30 per cent higher wool production than the local medium wool strains. Because of the South Australian strain's susceptibility to fleece rot, the possibility of control through twice yearly shearing has been investigated. Control of fleece rot has been achieved by this means. The method is not economic, however, because of the markedly lower price per pound for the half-length wool.

A further problem with the South Australian strain is reduced fertility at the early autumn joining preferred in New South Wales. Double shearing improved lambing results, but not nearly enough to achieve parity with the Trangie medium wool strain.

The usefulness of the South Australian strain in the first-cross lamb industry is being examined at Condobolin Agricultural Research Station. In comparison with Trangie medium wool strains, the South Australians had higher fertility when joined with Border Leicester rams in the spring but lower fertility when joined in the autumn. There has been little difference between the strains in carcass weight or grade of wether lambs. As the first-cross industry prefers a spring joining, the South Australian Merino ewes may have particular value, especially if their spring mating ability is carried through into their first cross ewe progeny destined for use in specialised, prime lamb production.

"Shoulder Strip" Method for Ranking Rams on Fleece Weight.—A further experiment has shown that the normal shearing position gives a satisfactory result, in comparison with the initial method using the sheep held in lateral recumbency.

Pasture Digestibility Studies at Leeton Research Station

Sheep, maintained in "metabolism cages", are fed cut pasture—in a study of the feed value of irrigated pastures. The amount eaten is measured; the faeces is collected and analysed for nitrogen and organic matter content. The work with caged sheep is preliminary to sheep-grazing experiments on irrigated pastures.

"Weaning Weight" Selection Groups.—Calculations showed that weaning weight dropped 0.19 lb for every one per cent increase in inbreeding—not a high enough regression to alter response in the selection experiment. Differences in weaning weight between the selection flocks are due to genetic differences in growth potential. It is not a passive response to the increased milk production.

There has been close agreement of calculated and realised genetic correlations between weaning weight and other production characters. There would be no antagonism between selection for weaning weight and improvement in other characters, although skin fold would probably decrease.

Other analyses have shown that reproductive performance did not increase in step with increased weaning weight, probably because of automatic selection against twins in the early generations of the experiment. There is little difference in the carcass characteristics of "Weight Plus" and "Weight Minus" lambs—nor is there evidence that faster growing lambs are more efficient converters of feed to meat.

POLL MERINO BREEDING

The reproductive performance of genetically polled and horned Merino rams has been compared at Trangie and in several commercial environments (129 rams joined with 5,600 ewes). Results showed no advantage for polled rams.

INFLUENCE OF SELECTION ON EFFICIENCY OF CONVERSION OF FEED TO WOOL

A more detailed examination of the nutritional factors underlying the superior wool-growing ability of sheep selected for high fleece weight has shown that increased feed intake is of little importance. Efficiency of conversion accounts for almost the entire increase. At high levels of nutrition, "Fleece Plus" sheep respond by growing much thicker fibres, so increasing their relative advantage over "Fleece Minus". This finding has been confirmed with ewe flocks in the field, using the stress of pregnancy and lactation as the factor diminishing wool growth.

Wool growing efficiency is also being measured in the Weaning Weight selection flocks. This work has shown a direct relationship between body weight and feed intake. The "Weaning Weight Minus" selections may be slightly more efficient converters of feed to wool.

INFLUENCE OF SELECTION ON FERTILITY

Reciprocal matings between the "Folds Plus" and "Folds Minus" flocks have shown the importance of the "Folds Plus" ram in depressing percentage of wet ewes and percentage of twin births. The high neo-natal mortality of "Folds Plus" lambs was caused by heavy birth weight and dystokia. There is a high positive genetic correlation between fold score and birth weight.

Observations have been continued on annual changes in face wool. These show wethers with more face cover than ewes. Irrespective of sex there is a marked seasonal pattern with lowest levels in late spring-early summer, and highest levels in April-May. There is also circumstantial evidence that rough pasture may physically remove face cover.

ENVIRONMENTAL INFLUENCE ON RAM FERTILITY

Rams from the Trangie "Folds Plus" and "Folds Minus" selection flocks have been studied, using climate room facilities provided by the C.S.I.R.O. Clunies Ross Laboratories. This work has shown firstly that "Folds Plus" rams are unable to maintain a low testicular temperature under heat stress and, secondly, that this inability is associated with a low scrotal sweating rate.

COMPARISON OF TWO MANAGEMENT SYSTEMS FOR LAMBING

The full drifting system of 40 x 16 acre paddocks was used at the 1964 lambing. Of the 189 "Fertility Flock" lambs born in this system—12 per cent died between birth and weaning. There were no deaths of lambing ewes. This compared with losses of 24 per cent of lambs and two per cent of ewes in the comparable group lambed without supervision.

Further development planned for the drifting system in 1965 include improved control of predation and the fostering of lambs born as triplets.

TRANGIE STATION'S CO-OPERATIVE SHEEP INDUSTRY PROJECTS WITH OTHER STATIONS OR INSTITUTIONS

At C.S.I.R.O. Riverina Laboratory, Deniliquin

A Trangie Research Officer has spent a year's in-service training at Deniliquin, studying techniques in the field of pasture utilisation. Projects on selective grazing by sheep on several natural pasture communities were completed. A method of sampling grasses for *in vitro* digestibility determination was developed.

At Tamworth Station

Dorset Horn versus Cheviot; Ram Comparison Trial.—This experiment has been expanded to include the Border Leicester x Merino as well as the other two ram breeds. There were no result differences between the three sire groups, in contrast to previous years when the Dorset Horn has given better results than the Cheviot. Within breeds, production has not been influenced by "type", i.e., by whether the ram was chosen visually as a good or poor representative of its breed.

At Shannon Vale Station

Sheep Breeding and Pasture Management.—In the experiment comparing Merino breeding units run at high (6 breeding ewes to the acre) and moderate (2 breeding ewes to the acre) stocking rates, the 1964 lambing data showed significantly higher twinning at the moderate level. The high fleece weight strain also had higher twinning than the low fleece weight strain, averaging across stocking rate treatments. Lamb losses, post-weaning, were much higher, at the high stocking rate.

The first groups of 18 month old ewes grown in this experiment were shown in 1965. There was a highly significant interaction between stocking rate and strain of ewe. In the high stocking rate farm, the fleece-weight advantage of the high fleece-weight strain was reduced from 3.8 lb to 2.0 lb.

In other experiments, running wethers at rates of 4, 8 and 12 per acre, there seems to be little advantage in annual superphosphate applications above 1½ cwt per acre. A management system using strategic grazing has so far shown little advantage in comparison with set-stocked controls.

At Cowra and Glen Innes Stations

Crossbreeding in Prime Lamb Production.—In the initial phase of this work, Merino ewes are being mated to three breeds of ram: Merino, Border Leicester and Dorset Horn. Results to date show similar fertility for the three groups. The first-cross wether lambs have a 20 per cent advantage in carcass weight over pure Merinos.

The second phase of this work commences in 1965, with the mating of the three groups of ewe progeny to either Border Leicester or Dorset Horn rams in either spring or autumn.

At Cowra Station

Hybrid Vigour in Prime Lamb Production.—The aim of this experiment is a quantitative assessment of the production characters affected by heterosis, in the cross between Border Leicester and Merino. In 1964, hybrid vigour was again demonstrated—with birth weights, lamb survival, growth to weaning, and fleece-weight at 18 months. The Merino also demonstrated its capacity for milk production when suckling lambs—with a potential for high growth rate.

SHEEP INDUSTRY RESEARCH: LEETON STATION

BREED COMPARISON EXPERIMENT—PRIME LAMB PRODUCTION

Three hundred Merino ewes were divided into three equal-sized groups. A group was mated respectively to Border Leicester, Cheviot or Merino rams.

The Border Leicester x Merino lambs grew faster and gave higher financial returns than the Cheviot x Merino lambs. The Merino x Merino lambs grew the slowest and gave the worst financial return. The Cheviot x Merino lambs had the most desirable carcass quality for a given liveweight.

EFFECT OF SHEARING EWES PRE-LAMBING

This trial was commenced in spring 1963, to be carried out over 2-3 years. The aim is to study the effect of pre-lamb shearing on production by Border Leicester x Merino ewes in the Murrumbidgee Irrigation Areas.

Double shearing has increased the annual, greasy fleece-weight and there has been reduced wool production from the autumn-joined ewes. Wool yield estimates by eye have indicated that yield differences between the groups have been small.

EFFECT OF TIME OF DROP ON COMMENCEMENT OF EWES' SEXUAL SEASON

This trial was commenced in 1962 to study the effect of time of the year at which ewes themselves are born—on the commencement of their sexual season. To accomplish this, four groups of Border Leicester x Merino ewes have been bred at Yanco Agricultural Research Station and transferred to this Leeton Station at weaning.

The ewes are joined to harnessed teaser rams in mid-October each year and dates of oestrus are recorded. The rams remain with the ewes until all or nearly all exhibit oestrus.

All ewes have now reached maturity. The 1964-65 results show no significant differences for dates of commencement of sexual season. This year the ewes were mated to entire rams. Observations will be continued for a further season but even at this stage it is evident that time of drop has no influence on commencement of the sexual season of Border Leicester x Merino ewes. The 1962-63 and 1963-64 differences in dates of the sexual season commencement were probably due to relative immaturity of the groups.

RATES OF STOCKING

This experiment is a study of (i) the production of autumn lambing ewes on subterranean clover-Wimmera ryegrass pastures; and (ii) the effect of management on production of autumn lambing ewes.

It was started in February, 1964, and is still in progress. The Border Leicester x Merino ewes are stocked at two rates; 3 and 6 sheep per acre. Although ewe numbers are small, the percentage of lambs born in the two stocking rates was identical (95 per cent).

At this stage very tentative conclusions can be drawn, as follows:—

(1) Three autumn lambed ewes per acre can be carried throughout the year without any form of pasture management. Growth rate level of lambs has been excellent and pasture availability has been adequate at all times. The use of summer pastures at this level of stocking has been very wasteful, in physical and economic terms.

(2) At six ewes per acre some form of pastures management in the autumn appears necessary. Growth rate of lambs receiving summer pasture is at this stage above that of lambs on winter pasture alone. Whether this will continue and whether the use of summer pasture at 6 sheep per acre is economical remains to be seen.

FEED INTAKE OF EARLY WEANED AND SUCKLING LAMBS

On irrigated pasture, lamb growth rate is rapid early but declines. A suggestion is that this poor growth rate in the latter stages is due to inadequate intake of pasture dry matter even though ample pasture is available. It was decided to measure the dry matter intakes of lambs growing on irrigated pastures, and determine to what degree early weaning increased the intake of pasture in an attempt to compensate for loss of milk from the diet. It was also decided to examine the effects of dosing irrigated pasture lambs with selenium and vitamin E, together and separately.

Chemical analyses have not been completed as yet. But preliminary figures suggest that the pasture dry-matter intakes of the weaned lambs were higher than those of the suckling lambs at 9, 12 and 16 weeks of age by 75 per cent, 19 per cent and 16 per cent respectively.

Growth rate from birth to 16 weeks of age was 0.55 and 0.62 lb/day for weaned and suckling lambs, respectively.

No advantage appeared from the administration of selenium or vitamin E at 9 weeks of age. If anything, there appeared to be a depressant effect. Early weaning, as expected, reduced lamb growth rate and carcass quality.

DIGESTIBILITY STUDIES

Eleven more digestibility determinations were done. Dry matter digestibility figures so far obtained range from 85 per cent in June to 66 per cent in November for subterranean clover-Wimmera ryegrass pastures, and from 79 per cent in December to 54 per cent in April for paspalum-white clover pastures.

A preliminary regression equation for dry-matter digestibility and faecal nitrogen percentage has been derived. It has to be finalised before it can be presented for use in estimating dry-matter intake.

SHEEP HUSBANDRY RESEARCH; GLENFIELD STATION

EFFECT OF UREA SUPPLEMENTATION ON BODY WEIGHT OF SHEEP

The effect of urea supplements under grazing conditions was investigated in trials on eight properties. Results are now being analysed.

Progress results indicated low consumption of urea blocks and mixtures under paddock conditions that provide sufficient nutrients to maintain a relatively constant body weight. When sheep commence to lose body weight, and protein content of the pasture decreases, consumption of urea blocks and mixtures increases, and the rate of loss of body weight is lower.

Effect of Urea Supplementation on Water Intake by Sheep.—Provision of blocks containing 7 per cent urea to Corriedale and Polwarth wethers increased water intake significantly. Two blocks were used. One contained 45 per cent barley in addition to urea and minerals. In the other, sorghum replaced the barley, but otherwise the ingredients were the same.

The control group consumed an average of two pints of water per day. The water consumption figure for the groups fed the blocks containing sorghum or barley was 6½ and 5 pints respectively.

Similar, relative rates of water consumption under grazing conditions could be important during periods of water shortage.

CATTLE HUSBANDRY RESEARCH; LEETON STATION

MINERAL STATUS AFFECTING PERFORMANCE

Several elements—including selenium, copper, potash, magnesium—have been subject of study for their effects:

Selenium.—The possibility of a selenium deficiency affecting the growth of recently weaned cattle was examined. Selenium drenching did not alter the growth rate in comparison with untreated stock.

Copper.—Liver copper levels in cattle on this Station were found to be in the marginal range (below 22 ppm) in many cases. However, steers in a grazing experiment failed to respond to copper therapy with 450 mg copper glycinate (120 mg copper equivalent).

Pasture samples taken throughout the grazing period of the winter pasture showed copper levels of 12 ppm. Molybdenum levels of liver and in the pasture (2 ppm) were not excessive.

Potash.—Further sampling and analysis of pasture for potash showed that this element was at a satisfactory level (2 per cent). Much lower levels (0.5 per cent) were recorded in pasture after it had hayed-off.

Magnesium.—Abnormalities of the mucosa of the alimentary tract of cattle on this Station have been recorded on a number of occasions. Detailed autopsy examinations on 17 animals in July, 1964 confirmed the presence of varying degrees of hyperaemia and inflammation in the ileocaecal valve, caeco-colic region and jejunum. Examination at the Veterinary Research Station, Glenfield continues to show eosinophilic infiltration. The degree of parasitism could not be related to this. Magnesium deficiency is known to cause eosinophilia. Preliminary analysis has shown a mild hypomagnesaemia in some animals.

PERFORMANCES OF CATTLE GRAZING SHORT AND LONG PASTURE

As part of a broader study a trial was carried out to determine any difference in performance of cattle grazing long compared to short, pasture swards.

The experiment was a 2 x 2 x 2 factorial design, twice replicated. In addition to pasture length, it included treatments for coccidiosis and also with selenium Twenty-four weaner Angus steers grazed the subterranean clover-ryegrass pasture from May, 1964, until November, 1964.

The average weight gain of animals on long pasture over the 180 days of the trial was 432 lb/head. This differed significantly from 372 lb/head for the animals grazing the shorter pasture.

FERTILITY

A fertility study was made over five years, involving 600 yearling heifers. It showed that pre-mating weight or age did not affect conception rate. Likewise, pre-calving weight was not associated with incidence of neo-natal loss of calves.

CATTLE HUSBANDRY RESEARCH; WOLLONGBAR STATION

PASTURE REQUIREMENT STUDIES

Studies to determine the feeding value of legumes, grasses and mixtures and the effect of stage of growth on feeding value have continued—using wether sheep in metabolism cages. The factors measured have been voluntary intake (when sufficient pasture has been available), dry matter, protein or fibre digestibility, and nitrogen balance.

These studies have led to some conclusions as follow:—

When a tropical legume is included in a pasture, digestible protein intake is most unlikely to be the first limiting factor to animal production. The quantity and quality of pasture available, which determines digestible energy intake, first limits dairy cow production in this environment. This is particularly so where pastures are unimproved, summer-growing grass.

The intake of cows, grazing either unimproved grass pasture or a similar pasture plus access to supplements of tropical and temperature legumes, has been determined by using the chromic oxide/faeces nitrogen technique. Measurements have shown that intakes of cows on unimproved pasture are lower early in lactation (October) than they are when 6-7 months in milk (February). The intake of these cows in the autumn has been above the estimated requirement of cows at the production level they were achieving. This suggests that the maintenance requirements of grazing cattle under conditions of low pasture density may be far greater than previously thought.

PRODUCTION OF SUMMER-CALVED COWS

Production of spring-calved cows grazing existing unimproved grass pastures has been measured. This has been compared with summer-calved cows grazing a new pasture system based on partial development with tropical and temperate legumes. The trial was commenced in 1962. Preliminary examination of the results indicates that:—

(1) Production from unimproved grass pasture was comparable with district figures achieved on farms with similar pasture. The optimum stocking rate on this type of pasture lies between one cow per 2.0 acres and one cow per 2.5 acres.

(2) The tropical legume *Glycine javanica* in combination with kikuyu grass provided a reliable source of forage each year despite wide variation in environmental conditions, and this was reflected in animal production.

(3) The area developed with the tropical legumes in this study was insufficient to provide high intakes of fodder during autumn-early winter.

(4) Animal production after completion of tropical legume grazing was affected by the variable yield of the temperate legume species caused by poor regeneration of subclover and by disease in vetch.

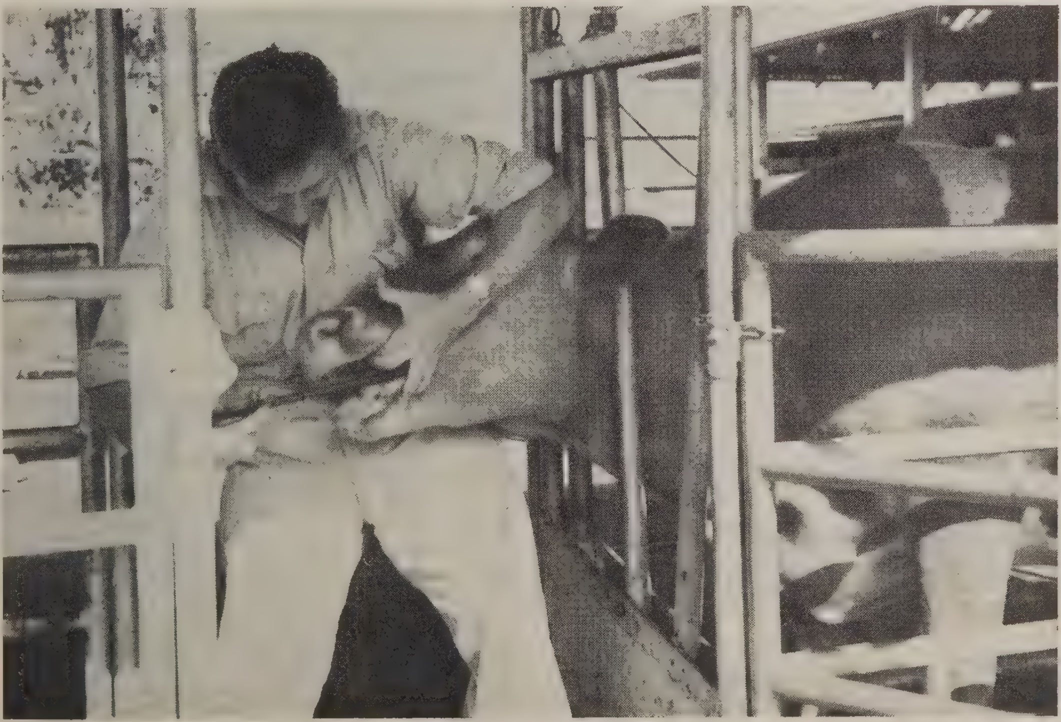
PERFORMANCE OF COWS ON GLYCINE JAVANICA-VETCH PASTURES

The tropical legume *Glycine javanica* has been sown over the whole of two 15 acre farmlets previously dominated by kikuyu grass. Vetch will be over-sown annually on about 20 per cent of each farmlet.

The performance of cows calving either in July-August or January-February will be compared, to assess if a change from the district normal time of calving is warranted when properties are fully developed with tropical legume.

The stocking rate initially will be one cow to 1.5 acres, and stock will be maintained on the farmlet on a year-round basis. Cows to calve in spring 1965 or summer 1965-66 have been placed on the farmlets.

In a preliminary study of the performance of spring-calved cows on a fully developed farm, 17 cows were maintained for 12 months from May, 1964, on 21 acres of *Glycine* (including 4.5 acres vetch). Production per acre was 140 lb butterfat, despite the extremely dry 12 months experienced.



Pastures' Feed-value Studies at Wollongbar Research Station

The cow is being dosed with chromic oxide. Calculations based on strength of chromic oxide in the faeces enable feed-values of grasses and legumes to be assessed. This has helped the selection of pasture species and combinations for the far north coast. *For example*: kikuyu grass maintains relatively high feed value if a legume is growing with it.

PIG HUSBANDRY RESEARCH; WOLLONGBAR STATION

Milk and Grain Feeding Trials with Pigs

Studies on the four hexagons outlined in the previous annual Report have now been completed. Statistical examination of the results has not yet been completed but preliminary analyses have been made. Based on these preliminary analyses are the following conclusions:—

(1) Level of feeding has little effect on efficiency of feed utilisation, except where quality and quantity of protein limit growth.

(2) Within any particular hexagon, adjacent levels of feeding could have widely different ratios of skim milk to crushed grain but the relationship between level of feeding and daily gain or percentage lean was generally highly significant. Thus, within the area of each hexagon, skim milk and crushed grain are close substitutes for each other.

(3) Desirable production factors are not necessarily associated with similar treatments. High daily gains mean that pigs require less time to reach slaughter weight, but, also, that pigs are likely to have fat carcasses that are less valuable than those produced on slower daily gains.

Pig Feeding Levels

In a factorial experiment, four blocks of eight individually fed litter mates were used. Two levels of feeding (3 per cent and 5 per cent), and at slaughter-weights of 70, 100, 130 and 160 lb liveweight, were the treatments investigated. The pigs fed at the 3 per cent level produced more lean and less fat per lb of gain than pigs fed at the 5 per cent level.

Analyses of variance revealed that, at each slaughter-weight, pigs fed at the 3 per cent level had a higher percentage of lean and a lower percentage of fat than those fed at the 5 per cent level.

Although the percentage levels of feeding remained unchanged during the experiment, daily gains tended to increase with increasing liveweight. Also, within each slaughter-weight range, pigs fed at the 5 per cent level had significantly greater daily gains than pigs fed at the 3 per cent level.

Meat Meal Quality Studies on Pigs

Two levels of meat meal supplementation of crushed wheat were compared with two levels of a high quality animal protein supplement comprising equal parts of fish meal and skim milk powder. Diets were fed individually at the rate of 3.5 per cent of body weight. Crude protein content was 17 per cent and 24 per cent for the low and high level respectively.

Treatment effect on daily gain was generally more distinct whilst the animals were below 100 lb liveweight than in the period from 100 to 160 lb liveweight. Within the 60 to 100 lb range the high level combination protein diet produced the greatest daily gains; the lowest daily gains were produced on the two diets containing low levels of protein.

Within the 60 to 160 lb range the high level combination supplement produced greater daily gains than the high meat meal or low combination supplemented diets; the lowest daily gains were produced on the low level of meat meal supplementation.

From 60 to 160 lb, pigs on the high protein diets required less feed per lb liveweight gain than those fed the low protein diets. Each of the two protein supplements produced more efficient gains when fed at the higher level.

Percentage of fat in the carcasses produced on the high level protein diets was significantly less than in carcasses produced on the low protein diets.

Zinc Supplementation for Pigs

Groups of pigs were fed either the high or low level meat meal diet, and with or without zinc sulphate—to provide a 150 ppm zinc supplement. The effect of high vs. low protein reported in the preceding project was noted, but no effect from the added zinc—despite the high level of elemental calcium (approx. 2.9 per cent) in the high meat meal diet.

Effect of Protein Level on Carcass Quality

This work has been conducted at Grafton Agricultural Research Station. The aim was to determine whether wide differences in protein levels of diets measurably affected carcass quality if fed after pork weight was reached. A diet containing 18.5 per cent crude protein on an air-dry basis was fed, on a scale reaching a maximum of 4.5 lb daily at 90 lb liveweight. Pigs were then fed 35 lb daily, to 160 lb weight, on diets containing 14.0, 18.5 and 22.5 per cent crude protein. Diet components were wheat, meatmeal and peanut meal.

Pigs fed the lower level protein diet after 90 lb weight had carcasses containing less lean meat than the pigs fed medium and high levels of protein. Depth of backfat decreased with increasing crude protein level, and eye muscle size correspondingly increased.

Pigs fed the high level protein diet required less feed per lb liveweight gain than did those fed the low level protein diet.

Pig Carcass Appraisal Measurements

Carcass Appraisal Systems.—The Hammond, Downey and Queensland carcass appraisal systems were examined. Each was found to have incompatible requirements for ideal fat content and ideal lean content. Carcass length was found to have no significant relationship to carcass lean content.

Specific Gravity Studies.—A correlation of —0.69 was found between specific gravity and lean content of hindquarters. This relationship was of the same order as that between width plus depth of eye muscle and total lean.

Production of Carcass Lean Content.—A multiple correlation coefficient of 0.96 was found between total carcass lean and measurements of eye muscle and backfat together with the weight of m. gracilis.

Evaluation of Good and Bad Carcass Conformations.—A preliminary study indicates that the difference in value between a well proportioned and badly proportioned carcass is approximately 4s.

Value of Kikuyu Grass for Pregnant Sows

Kikuyu grass value as a partial substitute for meal in the diet of pregnant sows is being studied. The results from three gestation periods indicate that access to kikuyu grazing will allow a 2 lb reduction in daily intake of meal by sows without affecting reproductive performance.

Piglet Nutrition

Alternate pigs in each litter farrowed July-August, 1964, received either oral ferrous sulphate or parenteral iron dextran to prevent piglet anaemia. No difference was apparent in the growth of these pigs to weaning. But, in litters farrowed in January-February, 1965, pigs receiving iron dextran grew faster than those receiving ferrous sulphate. Both groups grew faster than piglets left untreated.

Copper sulphate (to provide 225 ppm copper) added to the creep diet did not improve growth, compared with unsupplemented controls. There was an indication that copper adversely affected growth of pigs receiving oral ferrous sulphate.

POULTRY NUTRITION RESEARCH; SEVEN HILLS STATION

Meatmeal Investigations

Evaluation of Laboratory Tests.—Analyses and biological testing of 48 special samples of meatmeal has been completed. The results have been submitted for statistical analysis. Preliminary examination of the results offers confirmation that meatmeal's calcium content is the most important indicator of feeding value. In an otherwise adequate chicken diet, levels of calcium equal to that supplied by a meatmeal high in calcium will depress chicken growth about as much as the meatmeal but this does not mean that the high calcium level of the diet is the sole factor in the reduced growth. Increased proportion of bone protein and reduced muscle protein would also be correlated with calcium level.

The inefficiency of meatmeal's peroxide value as an indicator of feeding value may have reflected the chicken's present and past nutrition. This part of the experiment will be repeated, using chickens from a low vitamin E and antioxidant regime.

Variation in Commercial Meatmeals.—Meatmeal samples were obtained from all manufacturers registered in New South Wales. Each sample was examined, to assess the prediction value of its calcium level. The meatmeals were fed to chickens over a six day assay period, with and without equalised calcium levels in the final diet. Preliminary examination of the results has shown big differences between meatmeals in weight gain effect, whether calcium level was adjusted or not. But equalising the calcium intake almost halved the weight-gain variation between samples.

Mechanism of Growth Depression through High Calcium Intake.—The meatmeal investigation highlighted the problem of chicken growth-depression produced by calcium levels much in excess of the normal minimal requirement. Several experiments showed that growth depression occurred if the calcium level exceeded 1.2 per cent of the diet. Source of the calcium was relatively unimportant; carbonate, phosphate and chloride of calcium each produced similar depression.

The mechanism of this growth depression was examined. Increased intestinal alkalinity affecting digestion and absorption of nutrients was suggested as a cause; but the changes in alkalinity were inconsistent and occurred only at very high calcium levels (about 2.0 per cent)—whereas the growth depression occurred at lower calcium levels. Milk powder added to the diets reduced the effect of increased calcium. This was shown not to be due to addition of known vitamins. Also, lactose did not reproduce the effect of milk powder. More work has been planned.

Meatmeals in Laying Diets.—There is little difference between samples of meatmeals in effect on egg production. In a hatchability test associated with this experiment, there were differences between the meatmeals in proportion of chickens hatched. Investigating this observation, vitamin assays of the meatmeals were undertaken.

Vitamin B12 Content of Meatmeals.—Marginal vitamin B12 levels may exist in the poultry industry when meatmeals low in vitamin B12 are used.

In co-operation with an American Chemical firm, vitamin B12 assays of a series of N.S.W. meatmeals were completed. Results showed a 17 fold difference in meal vitamin content ranging from 24 to 372 micrograms per kilo. In a chicken experiment the meatmeal with lowest vitamin B12 content was unable to supply enough of the vitamin for maximum growth, if the level of meatmeal was restricted to supply 1.0 per cent calcium.

Riboflavin Content of Laying Diets

Importance of adding riboflavin to poultry breeding diets to ensure *maximum hatchability of the eggs* has been realised for many years, but that extra riboflavin may also be needed for *maximum egg production* has been established only recently.

Typical, practical, laying diets were fed to hens in two separate experiments. In each case, production increased at least 10 per cent where one to two grams of riboflavin per ton of feed were added. Riboflavin level of the basal diet in the current experiment was 2.0 parts per million.

Tabulated Rates of Egg Production re Feed Consumption

Tables available for expected feed consumption by hens at different rates of laying have been produced in other countries, applying a feedstuffs range and breeds of birds other than are typical in Australia. Using crossbred hens, in nutrition experiments at Seven Hills Poultry Research Station, data on rates of egg production and feed consumption have been analysed. Tables for local conditions have now been developed. These tables are as follows:—

Rate of Lay	Feed Consumption per hen per day	Feed per doz. eggs
per cent	oz.	lb.
30	3.02	7.56
40	3.13	5.87
50	3.24	4.86
60	3.35	4.19
70	3.46	3.71
80	3.57	3.35

Oestrogenic Activity of Triphenyl Ethylene Bromide ("Eitriphin")

Triphenyl ethylene bromide was subject of German patent 1040895 claiming increased rate of egg production by hens fed this chemical at the rate of 8g/100 Kg of feed. The chemical has been offered widely in the N.S.W. poultry industry as a feed supplement. The manufacturer's claims have therefore been examined. In a laying hen experiment, involving 200 hens receiving the chemical at the recommended rate, and 200 control hens, no increase in egg production was detected.

Structure of the chemical suggested some oestrogenic activity. This was confirmed in several chicken experiments. Inhibition of comb and testicle growth in male chickens, and stimulation of oviduct growth in female chickens, were used as indicators. It appears, therefore, that triphenyl ethylene bromide is an oestrogen and cannot be recommended for inclusion in any poultry diet.

Antibiotics

Availability of several new antibiotics, and suspected less growth response to some of the earlier types, prompted re-evaluation of the antibiotic situation in chicken diets.

Lincomycin, a new antibiotic, and bacitracin, were compared with penicillin, oleandomycin and terramycin for the first time in the brooder house at this Station. Penicillin, oleandomycin and terramycin had each been used before. Results showed a clear weight-gain advantage from using the new antibiotics.

Type of Antibiotic	Mortality	Av/Weight at 26 days
Nil	4/60	208.6
Lincomycin 2g/ton	7/60	246.3
10g/ton	2/60	241.0
Bacitracin 50g/ton	6/60	240.8
Procaine Penicillin 16g/ton	5/60	229.8
Oleandomycin 2g/ton	3/60	227.5
Terramycin	8/60	219.4
Bacitracin + Penicillin (50 + 16)	1/60	247.4
Least sig. difference $p < 0.05$		9.9

These and other results in recent years indicate the difficulties arising from recommending any antibiotic. Bacterial populations may have different spectra of sensitivity to antibiotics in different localities and at different times.

Minimum economic levels of bacitracin and penicillin are being examined in a further experiment.

POULTRY GENETICS RESEARCH; SEVEN HILLS STATION

Breeding for Egg Production

In this breeding programme, the response of widely differing flocks of poultry to selection for egg production, based on individual and family results, are being studied. The programme is now in its 5th generation of selection. Complete analysis of the progress in the breeding programme is proceeding, using electronic computer facilities elsewhere.

Breeding for Broiler Production

This programme was undertaken to produce meat-type stock comparable to commercial meat-strains, and to study problems of selection for body weight. Progress of the flock has been measured by comparison with an unselected crossbred, control flock. Several successful entries were made in the Random Sample (Broiler) Tests. The flock beat several leading commercial strains. As a result, breeders' interest in getting samples of the stock has increased.

Breeding for Egg Quality

More data have been collected for estimation of various genetic factors in egg quality. Special emphasis has been on egg size, shell strength, albumen quality, and blood spot incidence.

Investigation of inheritance of shell colour has commenced. Electronic equipment to measure this has been provided by the New South Wales Egg Marketing Board.

INHERITANCE OF FEED CONVERSION EFFICIENCY IN MEAT STRAINS

Little is known about the genetic control of feed efficiency in growing chickens. Growth rate appears to be a major component but there is evidence also of other factors. A single-chicken battery suitable for measurement of growth and of feed consumption in the meat flock is being designed.

Genetic correlation between growth and efficiency will be estimated, to assess whether independent variation in efficiency is enough to justify the design of breeding programmes to maximise selection pressure on efficiency.

DIVISION OF DAIRYING

Changes in Senior Positions

Chief of Division, Mr A. C. Small retired on 24th December after 40 years service with the Division, and Mr D. W. Crowfoot commenced duty as the new Chief of Division. Mr C. E. Chapman was appointed Deputy Chief, Mr D. R. Scott as Principal Dairy Officer (Herd Improvement), and Mr R. Laffan as Special Dairy Officer (Products other than Butter).

General

Activities Summary.—The activities comprised administration of the Dairy Industry and Dairies Supervision Acts and Regulations, Herd Production Improvement Scheme, extension and research related to the efficiency of the dairy industry, and maintenance of dairy product standards.

The Production Year.—The widespread drought conditions lowered production substantially, as shown by the following quantitative comparison of dairy products for this and the previous year:—

	1963-64	1964-65
Milk	328,411,000 gal.	297,878,000 gal.
Butter	80,295,249 lb	65,757,482 lb
Cheese	11,526,335 lb	9,244,488 lb

Drought Relief.—In the worst drought affected districts some officers were almost full time on distribution of gift fodder and participating in Drought Feeding Schools for farmers. Drought feeding of dairy cattle became a major extension project. Dairy officers made weekly surveys of the drought effects, for advice to the Treasury and to enable farmers to receive special drought relief aid. At head office, drought relief administration was a continual activity.

Appointment of Trainees.—The Division's traditional method of staff recruitment has been amended, from dependence in the main on attracting trained dairy technologists from industry, to a trainee system. This year six trainees were appointed; four at Hawkesbury Agricultural College School of Dairy Technology and two at the University of New South Wales in the School of Food Technology.

There will always be positions within the Division for specialist technicians with outside experience. But within two years the trainee system will yield the Hawkesbury trainees; and, later, the University graduates will fill research positions. The latter cannot be filled at present by inviting applications from outside sources.

Regulatory Services

FACTORIES AND SHOPS ACT

Departmental officers are authorised as Inspectors under this Act to supervise safety measures within the dairy industry. They took all necessary steps to ensure conformity with the Regulations. A June 1965 conference of senior officers of this Department and the Department of Labour and Industry resulted in District dairy officers remaining as Inspectors under the Act. Department of Labour and Industry inspectors will issue all remedial orders to dairy produce factories.

DAIRY INDUSTRY ACT, 1915-1962

Advisory Committee.—The Dairy Produce Factory Advisory Committee approved two applications for registration of premises as dairy produce factories and 13 applications for registration of a dairy produce store.

Appeal Board.—This Board, constituted under Section 2 to deal with appeals against decisions of inspectors, had no reason to meet.

Supervision of Dairy Produce Factories.—Supervision was maintained. Factory equipment remained satisfactory. Numerous extra items of modern, stainless steel equipment were installed; butter churns, milk and cream storage vats, cheese vats, vacreators and other equipment. These will reduce copper contamination incidence. Automation is increasing in dairy factories. Development of "in place" cleaning systems aided by more effective detergents and dairy sanitisers, has reduced labour costs.

Some factories in the Milk Zone have adopted an approved method of proportionate sampling of milk, for payment for butter fat surplus to the Milk Board standard.

Dairy officers continued to devote most of their time to milk and cream quality improvement on the farm and manufacture of high quality dairy products in the factory. Their work was helped by data from numerous chemical and biological analyses of dairy products by the Department's Division of Science Services.

BUTTER MANUFACTURE AND GRADING

Grading staff regularly examined butter and cheese manufactured by New South Wales factories and received at Sydney, Newcastle, Wollongong and Canberra for distribution and storage before sale on the local market. Samples from Wollongong and Canberra were sent to Sydney for grading.

In each case, the information from the grading was supplied to the factory managers and District dairy officers, to help overcome any quality faults or other manufacturing irregularities noted. Statistics from the gradings are basic to the Order of Merit competition conducted by the Department, and the Continuous Grading competition of the New South Wales Royal Agricultural Society.

Because of the drought in this State, large quantities of butter were imported from other States. At the request of the selling agent, the quality of this butter was checked by Departmental graders before distribution. The number of boxes of butter from interstate and intrastate sources examined by State graders approximated 1,386,000.

The grading officers also served as judges in the Dairy Produce Sections of the Sydney Royal Show; also Newcastle Show, North Coast National Show, Lismore, and other country Shows. Competitions held in conjunction with the New South Wales Division of the Australian Institute of Dairy Factory Managers were also judged by them.

Samples were regularly taken and forwarded to Division of Science Services for biological examination. The results were forwarded to District dairy officers and factory managers. Butter moisture and salt content analyses were also done, and the results went to District dairy officers and factory managers.

Some special investigations of butter quality defects were conducted at various factories, and the Division of Science Services co-operated in these.

Retail butter surveys of the Sydney metropolitan area and country districts were done to determine butter quality at consumer level. The samples were subjected to sensory grading and biological and chemical analysis. The results were discussed with distributors and manufacturers, towards checking any irregularities detected.

CHEESE

Cheese quality was maintained. About 80 per cent of the production was first grade. Twenty-five per cent of manufacture was submitted voluntarily for grading and, of this, three factories submitted 85 per cent. The participating factories perceive the advantages of having a grade on every mark. These factories have voluntarily participated in this grading, on a full year's production, for from 2 to 5 years.

Of 22 factories, 17 submitted samples for biological and chemical analyses. The main reason for non-submission by the five others was vacancy of the respective District officer position through staff changes.

The Biological Survey showed that cheddar cheese was of higher biological quality than processed cheese; and that non-cheddar types were poorer quality. The latter was probably due to the greater handling involved, compared with cheddar manufacture.

Coliform was more frequent than staphylococcal contamination.

Manufacture of soft varieties, especially cottage cheese, continued to expand. There are now six registered factories making this type. One south coast factory has completely changed over from cheddar to fancy varieties, including Fetta, Tilsit, Edam and Gouda; and a mid-north coast factory continues to convert a substantial proportion of the milk intake into Roman and Parmesan. The latter factory this year has branched also into Gouda manufacture and is doing some experimental work on rindless Swiss.

Interest in cultured milk products has expanded. At least 10 factories are making yoghurt, cultured buttermilk and cultured cream. The increase of fancy cheese varieties and cultured milk products is making heavier demands on Dairy Division officers.

Investigation into the expanding sale of cottage cheese and other unripened varieties revealed a number of manufacturers operating in premises not registered under the Dairy Industry Act. These are mainly in the outer metropolitan areas of the major cities. Steps have been taken to enlist Local Government Health Officers' assistance in locating the premises.

Changes have occurred in marketing of dairy produce by the bigger chain stores. In conjunction with the investigation into unregistered manufacturers, a number of premises where dairy produce is stored by these companies were located, and registrations were effected. A number of these stores have yet to be registered.

MARGARINE MANUFACTURING LICENSES

Following Ministerial approval, 1965-66 licenses for manufacture of table margarine, cooking margarine and margarine for export were issued to the seven firms concerned, for quantities similar to those previously licensed. The licenses for table margarine and cooking margarine were again subject to conditions designed to aid enforcement of table margarine quotas. The conditions facilitate access, by Dairy Industry Inspectors, to production records that must be kept by the licensees.

Extension Services

Dairy Science Schools.—Seven decentralised Dairy Science Schools were held, for tuition and examination of 327 candidates for qualification under the Dairy Industry Act.

Examination	Certificates Issued
Cheese making	21
Butter making	27
Milk grading	97
Milk testing	61
Cream testing	61
Cream grading	44

Statistics of Farm Visits.—Approximately 4,150 farms were visited by dairy officers for general extension work. Also, 96 farm visits were made in connection with Dairy Industry Extension Grant demonstrations, and 1,500 for herd improvement instruction.

Dairy Officers travelled by car 174,244 miles in the course of the year's work.

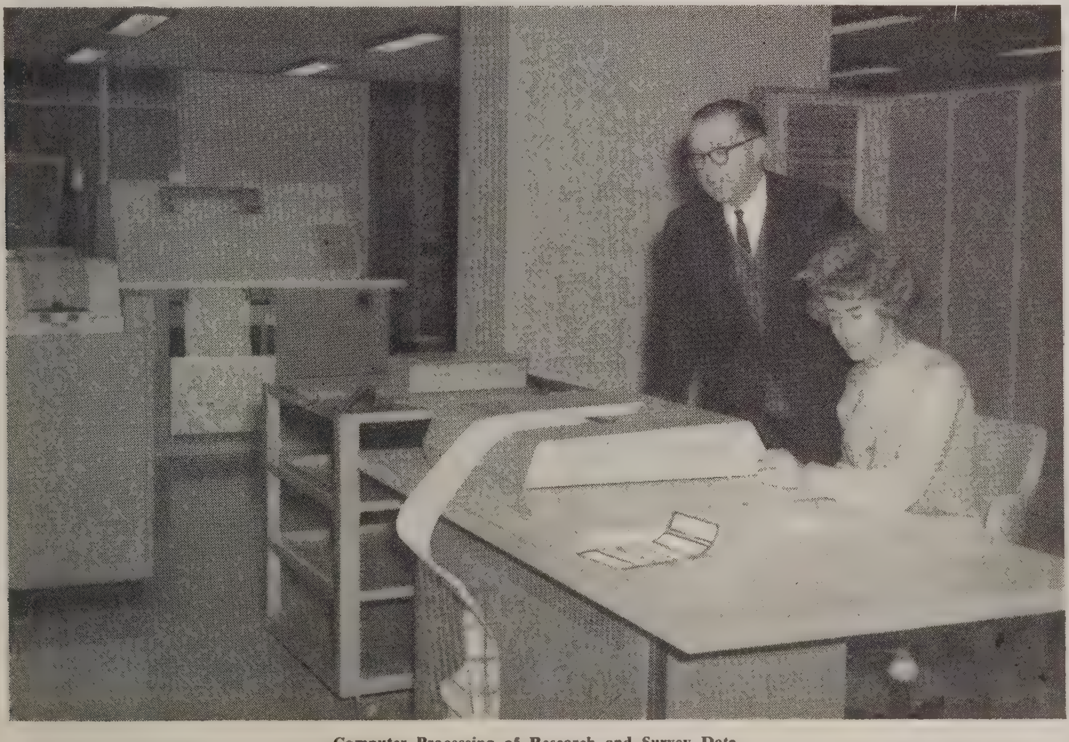
Statistics of Group and Radio Activities.—Dairy officers attended 150 field days, 35 films evenings, 110 meetings of Agricultural Bureau and other primary producer organisation's branches, and 35 Agricultural Shows, for extension purposes. At the Sydney Royal Show officers acted as judges and stewards in the Dairy Cattle and Dairy Produce Sections. Approximately 150 radio talks were given.

Commonwealth Dairy Industry Extension Grant.—Allocation of further funds from the Commonwealth Dairy Industry Extension Grant was of great value in maintaining and expanding the Herd Production Improvement Scheme, continuance of Sire Survey and Milking Machine Surveys, maintenance of an Air-flow Meter Testing Station at Hawkesbury Agricultural College, and the conduct of dairy farm demonstrations.

Herd Production Improvement Scheme

Herd Recording.—Recording of dairy cattle for milk and butter fat production is the basic means of providing dairy farmers with information on which to base a herd improvement breeding plan. Each year more dairy farmers request this service.

The total of cows under official test was 12,200 (11,300 in 1963-64); and some 73,000 group cows were entered, as against 70,000 in 1963-64. Currently, there is demand for ten more recording units, involving about 10,000 more cows.



Computer Processing of Research and Survey Data

A notable achievement this year by the Department's specialist computer team was the survey of the breeding worth of 6,000 dairy bulls. This was based on all production data available from their daughters' performances over the past two years. The results were achieved in 20 hours' computer time. By contrast, previously only 204 bulls had been so surveyed in several years—by the manual method.

Automatic Data Processing of Herd Recording Results.—Further difficulties were met in the changeover to automatic processing of herd recording returns. But the backlog has been overcome and all results have been circulated to farmers and District officers. The results for 1964-65 will be processed much more rapidly than those of the previous two years.

Solids-not-fat Recordings.—Collection of information by two solids-not-fat recording units in the field continued; from 1,250 cows, plus 250 Departmental cattle.

There is constant enquiry from farmers on the solids-not-fat aspect of breeding. One breed society has asked the Department also to consider establishing a solids-not-fat recording scheme for pure breeders. Consideration is being given to this possibility.

Sire Survey.—For the first time, the processing of sire survey material was done by computer. All group and pure bred sires with daughters completing lactations in the 1962-63 and 1963-64 recording years have been assessed. These totalled 6,000 bulls. The Relative Genetic Value method of assumption was used. From this material, some 400 pure bred bulls show sufficient information to warrant its publication. This will be done in a single, sire survey edition of the bi-monthly *Dairy Topics;* the July/August edition, 1965. This is probably the first time in the history of herd recording in this State that all bulls used have been surveyed.

Government Dairy Herds.—Stud and research activities were maintained at a high level in the Departmental dairy herds. Production from all herds has been adversely affected by the abnormal, dry conditions throughout the State. But the fall is not expected to be very great. There have been excellent supplies of conserved fodder on hand. Each herd, with the possible exception of that at Grafton Station, will be among the top herds of its breed.

Competitive Exhibits.—Results were again very satisfactory. Hawkesbury Agricultural College, exhibiting a smaller team, was again the most successful exhibitor in the Friesian section of the Sydney Royal Show. Yanco Research Station, Wagga Agricultural College and Grafton Agricultural Research Station also exhibited dairy cattle teams of very high quality and shared well in the awards.

At both the Sydney Royal Show sales and the breed sales, Departmental stock sold well and this is mirrored by demand for stock at the Stations. Each stud has demands beyond the capacity to supply.

Assistance in Establishing South East Asian Markets

Secondment of Dairy Officer Mr D. Gillies to the Australian Dairy Produce Board continued, to assist establishment of re-combining milk plants to develop the sale of Asian dairy products in south east Asia. Dairy Officer Mr A. K. Potts' secondment ended. He has resumed duty with the Department.

Research Activities

The Division's efforts to meet demands for research in the dairying industry continued to increase.

Butter and cheese quality are under investigation.

On the husbandry side, research continued into the problem of mastitis and milking machine efficiency and management. The milking machine survey continued to reveal a high proportion of inefficient machines. Development of standards of performance of machine components and materials continued.

Plans are well advanced for construction of a laboratory and administrative building adjacent to the School of Dairy Technology at Hawkesbury Agricultural College, to bring together all engaged in technological and other research. Generous assistance from the Commonwealth Dairy Industry Extension Grant and the Australian Dairy Produce Board continued.

RESEARCH AT HAWKESBURY AGRICULTURAL COLLEGE

The research team continued under the disadvantages of inadequate space and facilities, but the new building will be started in 1965-66.

Two vacancies for research officers exist, notwithstanding repeated advertisements. Employment of two University students during their vacations again proved successful. These Third Year undergraduates made useful contributions to the laboratory investigations.

RAPID METHODS TO DETERMINE MILK COMPOSITION

Total Solids.—Work on the rapid gravimetric method continued. After statistical analysis, the report will be submitted for publication. An exploratory study was made of a photometric technique depending on oxidation of organic matter.

Protein.—Preliminary work was conducted on the standard Kjeldahl method to ensure greater precision with the apparatus used.

Three rapid methods for protein were studied:—

(1) Automatic formol titration.
(2) U.V. Fluorescence.
(3) Dye-binding.

A report on (1) has been published (Bakalor, 1965a) and a report on (2) has been submitted for publication. Statistical calculations on (3) are complete and this work will be written up shortly. These studies have shown that (1) is the most accurate, followed by the amido-black technique (under 3). Method (2), originating in the U.S.S.R., did not fulfil its promise; modified instrumentation might improve it. A new dye, Procion Brilliant Blue was also examined under (3), but has not proved as good as Amido-black.

Apparatus.—New equipment this year included a Zeiss Spectrophotometer, an International Centrifuge, and a vaccum oven. Delivery of the Infra Red Milk Analyser (IRMA) was again delayed, pending modifications to the homogenizer.

EFFICIENCY OF DETERGENTS AND SANITISERS

This research is supported by the Australian Dairy Produce Board.

Accelerated Detergent Testing.—The early problems of obtaining repeatability on the milking machine simulator apparatus were overcome by using test room temperature control and modifications of the detergent dispensers. Using this apparatus, 13 commercial detergents and 7 cleaning systems were tested for cleaning efficiency and corrosiveness. Little difference was found between detergents tested. The results are being statistically analysed.

The object is to establish an interim standard for dairy detergents, for recommendations to the Australian Standards Association sub committee D-S/6.

Using this apparatus, cleaning systems were compared at different temperatures. This revealed a new cleaning technique, 60-70 per cent more efficient than any previous system.

Use of sequestering agents was also studied. These proved to be very corrosive.

Testing of Sanitisers.—No test comparable to field results was found. A modification of the International Dairy Federation test was found to be useful as a screening test for sanitisers.

Several materials were tested for use as udder washes, treatment of cracked teats and mastitis prevention. This project is continuing, using five control and five experimental farms.

Detergent Sanitisers.—As a result of work at Camden and in Queensland, the use of cold foam types and warm detergent-sanitisers based on quaternary ammonium compounds was investigated. When used in milking machines, all types allowed prolific development of coliform organisms. Bulk vats, when cleaned with types of cold foam detergents, were found to have a low surface bacterial content, and no coliforms were present.

Low Foam Detergents.—Several formulations of low foam detergents have been developed. Corrosion of tinned surfaces was completely inhibited. These formulations varied in cleaning efficiency.

Factory Detergents.—Work continued on the formulations of alkaline detergents for callandria cleaning.

Choked Pulsation.—The optimal choke apertures for different rates, ratios and cup consumption of air were determined.

Management and Mastitis.—This work was done as part of the sanitiser trial.

Tin-Nickel Alloy Thickness.—Electrical methods for determination of tin-nickel alloy plating thickness were investigated, but with limited success.

Milking Machines and Mastitis

This work is supported by the Australian Dairy Produce Board.

An experimental high line was constructed and work is proceeding on the low line machine. These machines are to be used to study:—

- (*a*) Vacuum stability and pressure change within the teat cup;
- (*b*) Various commercial inflations, in terms of their effect on:
  - (i) Milking Rate,
  - (ii) Udder Health,
  - (iii) Cup crawling, etc.
- (*c*) Choking the pulsation at different rates and basic ratio on the following aspects:
  - (i) The effect of choking on cow milking rate;
  - (ii) The effect of this on udder health, as measured by R.M.T. and by the change in desoxyribonucleic acid (D.N.A.) content of milk;
  - (iii) The effect of over choking on udder health.

DIVISION OF SCIENCE SERVICES

Biology Branch—Plant Pathology Section

GENERAL

Officers' Return from Overseas.—Mr K. E. Hutton returned from East Malling, U.K., and is continuing research on black spot of apple. Dr P. F. Kable returned from Cornell University, U.S.A., where he was awarded his Ph.D. and has resumed plant pathology research in the Murrumbidgee Irrigation Areas.

National Repository for Virus-tested Fruit Trees.—The Chief Biologist has spent considerable time as a member of an inter-State Committee, in determining the need to establish a National Repository for growth of virus-tested fruit trees. The Committee's report will not be finalised for several months.

Citrus Black Spot Work by Pathologist Visitor from South Africa.—Dr McOnie, a South African plant pathologist, has been studying the black spot disease of Valencia oranges with Dr T. B. Kiely at Gosford. Dr McOnie has established that there are two strains of the black spot organism. These are identical in spore size and both able to cause latent infection in citrus. But their growth rate differs in culture. Only the slow growing strain can develop further to cause rind lesions. The other remains latent. On evidence of isolations from rind, the black spot fungus has been recorded in citrus for many countries where the disease is not known to occur. The fungus has also been recorded from hosts other than citrus.

Dr McOnie has determined that isolates obtained from Camellias imported from overseas, and isolates from locally grown Dendrobium orchids, were of the strain non parasitic to citrus.

New Plant Disease Records

Fifty-two new plant disease records for New South Wales were made. Fifteen of these were new host records of *Meloidogyne* spp., the root knot nematodes. These and other records of root knot on various plants in New South Wales will be subject to a separate publication.

Of various species of *Cucurbita* grown experimentally, five were found to be susceptible to the common powdery mildew attacking cucurbits in New South Wales. This is an *Oidium* sp., with characteristics like those of the *Oidium* of *Sphaerotheca fuliginea* (Schlecht.) Poll.

Other new records of vegetable diseases included downy mildew (*Peronospora farinosa* (Fr.) Fr.) of English spinach and a minor leaf spot (*Stemphylium botryosum* Wallr.) of tomato.

An interesting record was anthracnose (*Colletotrichum graminicola* (Ces.) Wils.) on a line of rye grown in a trial at Goulburn. Anthracnose had been recorded before on cereals and grasses in New South Wales, but not on rye. Rye is reported to be severely damaged by it overseas.

Other records on field and fodder crops included root rot of vetch on the north coast, caused by an unidentified Phycomycete; and rust (*Uromyces trifolii* (Hedw. f.) Led.) and leaf spot (*Cercospora zebrina* Pass.) of knotted clover (*Trifolium striatum* L.).

Amongst ornamental plants, rust (*Puccinia cyani* Pass. in Rabh.), wilt (*Verticillium dahliae* Kleb.) and stem rot (*Sclerotinia sclerotiorum* (Lib.) de Bary) were recorded in a commercial planting of cornflowers (*Centaurea cyanus* L.). The common rust (*Uromyces dianthi* (Pers.) Niessl.) found on carnations was recorded on dianthus (*Dianthus sinensis* L.) for the first time. Another rust (*Melampsora euphorbiae-gerardinae* W. Mull.) which is widespread on the common weed (*Euphorbia peplus* L.) was found attacking young plants of the ornamental Snow-on-the-mountain (*Euphorbia marginata* Pursh.).

Several of the other new records of diseases concerned weeds and native plants.

The Biology Branch Herbarium

A full-time herbarium assistant was appointed. In consequence, the accessioning of specimens and preparation of card indices have progressed considerably.

More than 100 specimens were lent to overseas workers this year for systematic work. Exchange relationships with various institutions were established.

The Check List of Plant Diseases in New South Wales

Writing of this list progressed. Several sections have been typed in draft form. Investigation of systematic problems concerning many plant parasitic fungi continued. Many important type-specimens and old New South Wales specimens have been borrowed from other herbaria, to help solve these problems. Results of some of the investigations on certain rust fungi are in press, and others are in preparation for publication.

CEREAL DISEASES

Wheat Diseases

The weather conditions which were largely responsible for a record wheat yield also favoured the development of more disease than usual in wheat. Take-all was widespread in important degree and its incidence was probably increased by considerable use of new land uncropped to oats.

Barley Yellow Dwarf Virus.—This was common in wheat crops. Infection was mainly scattered within a crop, but some large patches of diseased plants were seen.

Results of trials set up at Tamworth and Condobolin to determine whether this wheat disease causes a yield loss in New South Wales were inconclusive. The trials are being repeated. Aphid trapping at both sites gave valuable information on incidence of vectors. This aspect of the work is also being repeated.

Flag Smut (Urocystis agropyri).—Incidence of this in northern New South Wales increased significantly. It seriously reduced yield in some crops.

A Tamworth trial of the efficiency of tetrachloronitroanisole (TCNA) against both seed and soil borne flag smut infections showed that TCNA gives good control of infection by both seed and soil borne spores, at the rate of 1 oz/bushel of a 50 per cent TCNA dust. This trial is being repeated. Also, a check is being made on the significance of some seedling injury symptoms following use of TCNA.

Take-all (Ophiobolus graminis).—Take-all occurs every year in wheat crops in New South Wales. This season it was much more prevalent. Losses in some crops were as high as 70 per cent-80 per cent.

Seasonal conditions were the most important factor. But another factor was the increase in new land, brought under wheat for the first time or after an extended improved pasture phase without a first crop of oats.

Continual farm vigilance and good management are needed to minimise wheat take-all incidence.

Leaf Spot (Podosporiella verticillata *associated*).—The fungus was isolated again this year from the typical leaf-spots on wheat, barley, oats, and a number of common grasses. This organism was first found associated with this leaf spot three years ago and since then been consistently isolated from the affected leaf areas.

No other record of this fungus associated with a definite leaf spot of cereals and grasses has been sighted. It has been recorded in Australia, and other countries, causing a rare seed rot and blight of newly germinated cereal seedlings—and recorded on seed of wheat, oats, barley grass and brome grass in soil in the field. During standard laboratory germination tests it also developed on three of 100 grains of rice grown in New South Wales.

Sorghum Diseases

Downy Mildew (Sclerospora sp.).—This seriously damaged an irrigated sorghum crop at Finley. Downy mildew of cereals and grasses is rare in New South Wales but this year it damaged sorghum, wheat, and oat crops. The climatic conditions favoured it.

Maize Diseases

Seed Treatment of Maize.—An experiment has been set up to determine the effect of various common fungicidal seed treatments on germination of maize seed stored for various periods after treatment. There have been complaints that certain chemical seed treatments seriously reduced germination, particularly when the seed was stored for a month or two after treatment.

The chemical seed treatments in the test are coversan, ceresan and panogen. Two common maize varieties have been treated. Samples are being taken each month, and germinated in sterile soil and in a "rag doll". The germination figures for each of the different treatments are recorded against the figure for untreated control seed. The experiment is to run for twelve months.

Rice Diseases

Downy Mildew (Sclerospora oryzae).—For the first time since 1930, downy mildew of rice was identified in New South Wales. It was in a crop at Coleambally. The disease seems unlikely to be of serious consequence.

Algae.—In November, 1964, the problem created by algae growing in rice bays at Yanco, Coleambally, Griffith and Leeton was inspected. Losses had occurred. The problem appeared to be growing worse. Algae accumulation may have been due in part to irregularity of water level in the affected bays. Accumulation of algae in the irrigation channels, and lack of critical control of water depth, may have contributed.

DISEASES OF MISCELLANEOUS FIELD CROPS

Tobacco Diseases

Blue Mould (Peronospora tabacina).—It was almost absent this year. Of the three occurrences recorded, two were in the Bonshaw district and one at Texas. In the hot dry conditions, these were only minor.

Virus Diseases.—Tobacco mosaic virus was widespread, as usual. On some properties symptoms did not appear until suckering. Tomato spotted wilt virus was also recorded.

Barn Rot (Rhizopus oryzae).—This was a serious problem on most tobacco farms. Up to 25 per cent of leaf in some barns was affected. The problem was generally more serious in leaf from lower plant positions. It diminished with leaf taken from progressively higher positions. Tests of the fungicide allisan for control have been inconclusive.

Cotton Diseases

Cotton acreage increased. Yields of up to two bales per acre were secured in Namoi districts.

Seedling Losses.—Some loss of seedlings was caused by unfavourable weather but production loss was not notable. Production by the remaining plants may have been greater because of seedlings lost. At an early stage, about 5,000 acres of seedlings were damaged by a severe hailstorm but these recovered.

Bacterial Blight (Xanthomonas malvacearum).—Dr Brinkerhoff in the U.S.A. has done race determinations for *Xanthomonas malvacearum* present in leaf samples from the Namoi district. His work has shown all to be of the same race.

Wilt (Verticillium dahliae).—Late in the season specimens of cotton infected with *Verticillium dahliae* were received from the Namoi district and from quarantine crops at Cowra.

Safflower Diseases

Wilt (Verticillium dahliae).—For the first time, this fungal wilt was recorded on safflower. The specimens were of the varieties Horowitz and 48 Al. They were grown at Bellata.

Suspected Virus Disease.—This suspect was recorded from the Coleambally irrigation district and from Leeton.

Linseed Diseases

Specimens of linseed frost damage were received. A nutritional disorder apparently caused by a lack of calcium was recorded on several occasions. Pasmo (*Septoria linicola*) was quite common again.

DISEASES OF FODDER AND PASTURE PLANTS

Cowpea Diseases

Stem Rot (Phytophthora vignae).—This causes serious damage on the north coast. In the 1963-64 season the variety Havana, previously field resistant to stem rot, had shown evidence of the disease. In the 1964-65 season determination of whether this was due to a new race of *Phytophthora vignae* was attempted. But infection under glasshouse conditions was poor. A conclusion could not be reached. Meantime, further examinations of the isolate have suggested that this stem rot of Havana cowpeas may be caused by another species of *Phytophthora*.

Clover Diseases

The diseases this year on clovers included leaf spots, rusts, root-knot and various nutritional disorders. However, no serious loss was recorded.

Lucerne Diseases

Phytophthora Root Rot.—In November, irrigated lucerne stands in the Hunter Valley were surveyed for *Phytophthora* root rot. Several young lucerne stands showed high incidence of dead or severely lesioned plants from which *P. cryptogea* was isolated.

Vetch Diseases

The intensive north coast study of disease problems in Golden Tares (*Vicia sativa*) continued.

Root Rot (a Phycomycete).—This disease is considered to be the most important, particularly on the red basaltic soils in the Wollongbar area. The cause of root rot, now shown to be a Phycomycete, was at first incorrectly thought to be *Fusarium* spp.

Identity of the Phycomycete is now being investigated. The fungus appears to differ from any described pathogen of *Vicia* species. It is capable of attacking a wide range of *Vicia* species. But considerable differences between susceptibilities of species have been noted through glasshouse inoculations.

Very dry autumn weather and resultant later sowing dates led to very mild incidence of root rot in most stands this season. But some stands were seriously thinned by the disease. This was where the paddocks had been sown to vetch several times previously and presumably the soil had a high level of the pathogen.

Decline (*Virus ?*).—Incidence of a suspected virus disease referred to as decline was very low this year. No progress has been made on the etiology of this disease.

Downy Mildew (Peronospora viciae).—This was in some stands, but it does not cause much loss.

Disease of Grasses

Spring Dead Spot (*Fungal*).—For several years now this so known disease has been occurring in couch grass turf. It shows as well defined more or less circular patches of dead, bleached grass. These can occur at any time of the year but are most common in spring. Several fungi have been repeatedly isolated from the affected grass.

One of these fungi has been studied in detail. It has been identified as *Ophiobolus herpotrichus* and by inoculation was shown to be capable of killing couch grass. Work is continuing, dealing with the importance of this fungus on various other hosts.

Several other fungi isolated frequently from spring dead spot are being examined in detail.

DISEASES OF VEGETABLE CROPS

Potato Seed Certification.—Records compiled by Division of Plant Industry showed for the tablelands no crops rejected from certification because of excess leaf roll or other virus content. On the northern tablelands some roguing for purple top wilt and blackleg was needed, to reach certification tolerance. A trace of leaf roll was in some crops in the area, but within the certification tolerance.

The Biology Branch is co-operating with Division of Plant Industry in building up foundation stocks of elite seed of a number of varieties. This is at the new Research Station, Orange.

Potato Late Blight (Phytophthora infestans).—In co-operation with Division of Plant Industry, development of potato varieties immune to late blight continued. This year's results showed five seedlings immune to the "O" race of *P. infestans*. Three of the seedlings were derived from the American, blight-immune variety Merrimack, one was from the Scottish, blight-immune seedling 835a (4).

Potato Common Scab (Streptomyces scabies).—Work in co-operation with Division of Plant Industry continued, for development of resistant varieties.

On the central tablelands, the dry season again favoured heavy attack. In this area, a scab resistance trial was carried out at Spring Hill. Scab reactions of a number of varieties and seedlings grown in the early and late maturity trials at the Research Station, Orange, were also assessed. In these trials, scab reaction ratings were calculated on severity of lesions. A scab index number (maximum 4) was calculated for each variety and seedling. The collated results from the two trials were as follows:—

(0-1) Norland (A scab resistant variety ex U.S.A.), S2902 (Delus x Redskin), S2904 (B595-76 x Smooth Rural x Katahdin), S2882 (Monak x 11-79).

(1-2) Fundy, S2897 (Redskin, natural pollination, S2789 Monak x 11-79), S2885 (Awaba x 336-123), S2889 (B595-76 x Adina), S2881 (Awaba x 336-123).

(2-3) Excel, 2890 (Sequoia x Cortland), Exton (susceptible control) and Sebago (susceptible control).

Potato Rugose Mosaic (*Virus X and Virus Y*).—Tests continued, of field reaction of a number of Departmental advanced seedlings to aphid infection by Potato Virus Y (PVY). Four seedlings developed a leaf drop streak reaction to PVY. These were S2289 (B595-76 x Adina), S2893 (66-10 x 11-79), S2901 (S2864 x Merrimack) and S2904 (B595-76 x Adina).

The American variety Norgleam, claimed to be resistant to PVY, was also in the test. It appeared field immune under local conditions.

Tomato Yellow Top (*TYT Virus*).—Through general application of effective control measures this disease no longer has economic importance. Investigational work has ended.

Tomato Fusarium Wilt (Fusarium oxysporum *f.* lycopersici) and *Verticillium Wilt* (Verticillium dahliae).—Cultures were prepared and supplied to Division of Plant Industry for use in breeding varieties resistant to these pathogens.

At request of the Vegetable Improvement Committee, several imported tomato varieties were tested at Rydalmere for reaction to one or both of the wilt fungi. Floralou, Porte, Nemared, Okla N-3-1-1 USP and Okla N-3-1 sp. were susceptible to *Fusarium* wilt. The latter four were also susceptible to *Verticillium* wilt. Hotset was resistant to *Fusarium* wilt.

Misting Machines.—In co-operation with Entomology and Chemistry Branches a further trial was made at the Horticultural Research Station, Narara. The main purpose this year was to study the effects of DDT rate variations, applied by misting machine, on control of *Heliothis* caterpillar. But disease incidence was also observed.

The dry season did not favour early blight (*Alternaria solani*), but 5 per cent of fruits harvested from plants receiving no fungicide showed early blight fruit rot. Plants receiving weekly high volume copper oxychloride (2½ lb/100 gallons) yielded 2 per cent affected fruit. Plants from three other treatments, each receiving weekly misting machine applications of copper oxychloride (4 oz/2 gallons), yielded 2.5, 2.5 and 2.1 per cent early blight affected fruit.

Asparagus Decline and Replant Problem, Gundagai.—Work continued at Gundagai, on the problem of the three parasitic *Fusarium* species attacking asparagus there.

In the continued tests, seedlings from survivors of a replanted block showed vigorous growth and no evidence of *Fusarium* attack. These seedlings, grown in flats of infested soil in the glasshouse, have been transferred to outside plots. Seed from them will be further tested.

Experiments with the *Fusarium*-tolerant strain of the Mary Washington variety continued. The plants surviving from a direct seeding of this strain into old asparagus land have been removed and placed in the seedling block of this strain—grown in old pasture land. Agronomic selection is now proceeding in this block.

Plants of the *Fusarium*-tolerant strain grown from crowns in old asparagus soil are showing vigor. Their first cut for spears occurred in late 1964. Their proportion of high quality spears at this first cut compared to that from the same age, commercial Mary Washington strains.

Bean Seed Certification Scheme.—This was continued, in co-operation with Division of Plant Industry. It was the Scheme's 22nd consecutive season. Of five crops, comprising 32 acres, one of 8 acres was rejected—for halo blight infection. A slight increase in seed production seemed likely, compared with the previous season, despite smaller acreage.

Stringless French Bean Root Rots.—Symptoms were described in last year's Report. Losses were again heavy in irrigated western and south-western crops grown for processing. Occurrence was associated with unusually hot dry weather. For the first time the disease was noted in the Bathurst and Windsor districts.

A line of Tendergreen which appeared resistant in last year's field trials was healthy in all areas inspected. But this line has several undesirable agonomic features. Pearlgreen and Tendercrop, the most popular processing varieties, were seriously affected.

Most of the dwarf stringless varieties ever grown in this State have been susceptible to the disease, but until now none of the stringed varieties has been affected. This year the disease was in the Redlands Belle stringed variety.

Some advanced lines of stringless beans bred by Division of Plant Industry were inspected at Yanco and Bathurst. They were healthy. Selected lines have been recommended for immediate naming.

The hot dry autumn also favoured Rhizoctonia root rot (*Rhizoctonia* sp.) and *Sclerotium* stem rot (*Sclerotium rolfsii*). These diseases are normally only sporadic. This year they caused widespread losses in near-Sydney crops.

French Bean Rust (Uromyces appendiculatus).—This is important in some seasons in coastal bean crops. Thirteen varieties and three breeding lines were exposed to natural infection in a field trial at Rydalmere. Redlands Greenleaf and Redlands Pioneer proved resistant. All other lines were susceptible. These included Hawkesbury Wonder, Brown Beauty, Clarendon Wonder, Windsor Longpod, Redlands Belle, College Early, College Supreme, College Pride, Tendergreen, Tendercrop and the three advanced breeding lines.

Glasshouse tests confirmed Redlands Greenleaf and Redlands Pioneer resistance to the race present in the Sydney Metropolitan Area. Westralia and Cornell 49-242 were also resistant in glasshouse tests.

Cucurbit Powdery Mildew (Oidium sp.).—This only slightly damaged rockmelon crops in the Murrumbidgee Irrigation Areas and the Lower Murray Districts. The extremely hot dry weather seemingly reduced the severity of the disease.

Rockmelon lines bred by Division of Plant Industry at the Yanco Station were again inspected, at Yanco and Griffith. They were free from powdery mildew, and from *Fusarium* wilt (*Fusarium oxysporum* f. *melonis*). Adjacent plants of susceptible varieties were affected.

In a Rydalmere screening trial the experimental fungicides WL 4204 (0.05 per cent), UC 21426 (0.05 per cent), and UC 19786 (0.1 per cent), and the recommended fungicides karathane (0.25 per cent) and morestan (0.009 per cent), were applied to Gold Coast rockmelons. Karathane morestan applied weekly and fortnightly, and WL 4204 weekly, gave good control. Fortnightly WL 4202 and weekly UC 21426 and UC 19786 were less effective.

Further collections (15) of the cucurbit powdery mildew fungus were examined on several new cucurbit hosts. Like all previous collections they showed several features of the imperfect stage of *Sphaerotheca fuliginea*. This was outlined in earlier Reports.

Sclerotinia Rot (Sclerotinia sclerotiorum).—The fungicide DCNA (2, 6 dichloro-4-nitroaniline) in last year's trials was found to be effective in controlling *Sclerotinia* rot. Now it is widely used in New South Wales; as a dip for harvested bean pods, and as a spray for ornamentals and vegetable crops.

Onion Yellow Dwarf (O.Y.D. Virus).—This was recorded last year for the first time in New South Wales. It was identified again, from the Griffith district, during the spring of 1964 but barely reduced total yields. The local seasonal conditions highly favoured onion production.

Lettuce Virus Diseases.—Lettuce necrotic yellows was again common, particularly in spring crops.

In the late autumn and early winter spotted wilt was also detected, in three near-Sydney districts. This lettuce disease, caused by the tomato spotted wilt virus, has symptoms very similar to those of necrotic yellows. Spotted wilt, once an important lettuce disease, has not been recorded for many years although many lettuce from different districts have been tested.

Mushroom Culture and Mushroom Diseases

Commercial mushroom culture continued at high levels of efficiency. New South Wales annual production now exceeds 5 million pounds weight. Of this production, 70-75 per cent is processed by canners. The remainder is marketed fresh. Quality of spawn supplied by commercial mushroom spawn producers continued to be satisfactory.

Diseases.—The eelworm *Aphelenchoides compositicola* was abundant in mushroom beds in three localities, Berkshire Park, Richmond and Ingleburn. The crop in each case was poor. This eelworm was also found at Orchard Hills, in soil intended for casing.

CITRUS DISEASES

Drought Effect

The drought seriously affected citrus health where adequate irrigation was not possible. Loss of old trees, particularly trees with impaired root systems, has been accelerated. Gumming of lemons, a drought-induced manifestation of shell bark, is widespread.

Grapefruit Stem Pitting (Virus).—Observations on permanent plantings are continuing.

Scalybutt (Virus).—Etrog citron stocks imported from California for trial as a scalybutt quick indicator have been built up. About 100 trees have been tested. The range of symptom development has been wide and appears to be modified by the presence of tristeza-stem pit virus. Positive reactions have been obtained from shell-bark affected lemons and Seville oranges, confirming the possible relationship between shell bark and scalybutt. Strong positive reactions from declining bittersweet Sevilles have confirmed the theory that this condition is due to scalybutt virus and is related to the type of decline reaction shown by lemons before bark shelling.

Psorosis (Virus).—Indexing of Departmental mother trees continued. No positive case was found.

Black Spot (Guignardia citricarpa).—At Mangrove Mountain the black spot spray trial was continued on a 26-year-old block of Valencia orange trees. Seven promising fungicide schedules (2 and 3 sprays) were compared in a replicated and randomised block layout. Harvested at 8th February, the fruit was graded for disease incidence.

At this time less than 30 per cent of the crop from non-sprayed trees was free of black spot. Percentages of clean fruit from the treatments were as follows: Perenox-oil followed by antracol-oil, two applications, 97 per cent; Bordeaux mixture 2½-2½-100-oil, two applications, followed by zebtox, 95 per cent; Bordeaux mixture 3-3-100-oil followed by zebtox, two applications, 95 per cent; Perenox-oil, two applications, followed by zebtox, 94 per cent; cuprox-lime followed by zebtox-oil, one application, 92 per cent; Bordeaux mixture 5-5-100-oil followed by zebtox, two applications, 90 per cent; and Bordeaux mixture 5-5-100-oil followed by zebtox, one application, 83 per cent. No significant differences could be established for the results from the first six of these fungicide schedules.

Fruit from trees receiving schedules that included zebtox had the insipid flavour, with reduced acid content, previously noted on this soil. By omitting white oil from these sprays, juice quality was improved. But then the fruits' external appearance suffered, due to rind injury by rust mite.

The antracol schedule did not cause any noticeable deterioration in juice quality. This dithiocarbamate will be further tested.

At Jilliby a limited spraying trial continued on 24-year-old Valencia oranges. Bordeaux mixture 5-5-100 followed by zebtox, two applications, was compared with Bordeaux mixture 5-5-100 followed by antracol, two applications, and with copper-oil followed by curit, two applications. Very little black spot developed in this orchard. Hence, differences in disease control could not be shown.

In this trial the Bordeaux-antracol schedule produced fruit outstanding for appearance and internal quality, and seemed superior to the other two schedules.

At the Horticultural Research Station, Narara, screening of several 3-spray fungicide schedules continued. These included a copper fungicide in the petal-fall application, followed in the two subsequent applications either by zebtox, antracol or perenox. Inclusion of wettable sulphur (0.2 per cent) in these applications was also studied.

Each satisfactorily controlled black spot (95-85 per cent clean fruit). There was no real difference.

Addition of wettable sulphur to the zebtox sprays did not improve fungicide efficiency but much better colour and quality of rind was noted. No burn or rind blemish was caused by adding wettable sulphur to zebtox or perenox spray applications, despite the summer temperatures.

Brown Spot of Emperor Mandarin.—On young Calamondin plants at the Horticultural Research Station, Narara, the strength and frequency of cuprox (copper oxychloride) sprays needed to control leaf and stem infections were studied.

Three treatments, commencing at petal-fall, and an untreated control were compared. The treatments provided *weekly* applications of 0.25 lb/80 gal, 22 applications; *fortnightly* applications of 0.50 lb/80 gal, 12 applications, and *six-weekly* applications of 1.0 lb/80 gal, four applications. As well, half the plots received in mid September a pre-blossom thiram spray of 2.0 lb/80 gal. Leaf and twig infections were assessed in March, April and June.

The early spring thiram spray consistently reduced the number of infected leaves, but did not reduce the number of stem lesions. In general—the treatments reduced the number of infected leaves and stems. This was apparent on each of the three assessment occasions. Stem infection reduction was more marked on the later assessment dates.

Weekly were not better than fortnightly spray applications in controlling leaf infections, but gave control of stem infections. The six-weekly applications were inferior in leaf and stem infection control.

Citrus Nutrition Research.—A paper reporting the findings of a citrus nutrition pot experiment has been submitted for publication. Collaborative with the Chemistry Branch and the Division of Horticulture, this project examined the influence of seven nutrient treatments on leaf mineral composition, yield, and aspects of fruit quality.

Arising from results of this experiment, a second nutrition pot trial has been commenced at the Horticultural Research Station, Narara. This is to examine the influence of various levels of nitrogen, potassium, calcium and magnesium on mineral composition of the leaf, yield, and aspects of fruit quality.

Stubby Root Disease.—Work continued on the relation between *Trichodorus* nematodes and a stubby root condition of citrus. Surveys have shown that at least four species of *Trichodorus* occur widely in N.S.W.

Histological studies of stubby roots showed no endoparasitic activity. Nursery stock with bare washed roots carried few *Trichodorus*.

Other studies have shown that: *Trichodorus* occurs in soil to a depth of at least two feet; population levels remained constant in soil samples stored in plastic bags for 18 days; *Trichodorus* survives in fallow soil for at least 90 days; and its host range includes many common weed and crop plants.

DISEASES OF POME FRUIT

Apple Scab (Venturia inaequalis).—Infection conditions in the spring were very favourable in all highland districts. There were some losses, but the drought which prevailed after mid-November limited the progress of the disease.

The Black Spot Spray Warning Service: This was continued at Orange in association with Division of Horticulture regional staff and the channels of mass communication.

Dispersal of Ascospores: At Orange, air-borne ascospores were trapped on 19 days from September 10th to November 13th. Eight infection periods were recorded between the green-tip stage on September 10th and virtual cessation of ascospores release at the end of October. These infection periods occurred on September 11-12-13; September 22; September 27-28-29; October 2-3-4; October 6-7; October 10-11-12; October 17; and October 29-30.

Dispersal of Conidia: Aerial dispersal of conidia on dry as well as wet days was again recorded at Orange. This confirmed the Department's earlier records, and the Hirst and Stedman observations in England in 1961. Earlier, conidia were thought to be water-borne only.

The first conidia were trapped on October 17. These were probably from ascospore infections during the September 27-28-29 infection period. Highest recorded concentration was 971 conidia per cubic metre of air, at 3 p.m. on November 13, during a hailstorm. Small concentrations of conidia were detected on some nights, but the dispersals were mainly in daytime.

In April, when the trees in the non-irrigated test orchard had lost 80 per cent of their leaves through five months of drought, trapping revealed a similar diurnal periodicity in conidial dispersal—unrelated to rainfall.

Control by Suppression of Inoculum.—In May, 1965, each of 60 Granny Smith trees in an isolated orchard at Maroota was closely examined. Only one leaf lesion was found. These trees have had a pre-leaf fall organic mercury spray each autumn since 1955 (except in 1957). No other fungicide has been used on them for scab control during these years. Contrasting with the earlier history of heavy infection in this orchard, only eleven scabbed apples have been seen since the experiment began. None has been detected since 1958. However, close scrutiny of the trees each season has revealed a continuing trace of leaf infection—usually in autumn.

Mercury Content of Fruit after Post-harvest Mercury Sprays: Fruit collected in February, 1965, from the Granny Smith trees sprayed each April since 1955 in the Maroota experiment (see previous paragraph) were analysed by Chemistry Branch. No more mercury was found than in fruit from trees never sprayed with mercury. This, after nine post-harvest applications of mercury, confirmed an earlier analysis which showed no increase of mercury in fruit collected in February, 1957, after two post-harvest treatments. Analyses of bark from one, two, three and four years old growth indicated an increasing accumulation of mercury in or on the bark, with increase in number of sprays applied. Mercury was not detected in current season growth.

Apple Limb Canker (Botryosphaeria ribis).—Infection was heavy on the central coast, particularly on the early maturing varieties Willie Sharp and Kirks. This was in severe drought conditions, in late summer and autumn. On many properties these varieties were not irrigated after they were harvested in January. Heatwaves in March seemed to predispose the drought-affected trees to infection. In one orchard where canker progression was alarmingly rapid a 0.05 per cent PMC spray in April appeared to halt progress of the disease, but did not kill the fungus in the cankers.

Virus Diseases of Pome Fruit.—During the 1963-64 season the necessary inoculations were done, to index one of the Red Jonathan apple trees recommended by the Department as a source of budwood for nurserymen. Results so far indicate presence of chlorotic leaf spot virus. This is one of the latent viruses that do not cause visible symptoms on commercial varieties.

Buds from the recommended tree were submitted to heat therapy (100°F for 30 days) in an attempt to eliminate viruses. Growth from the treated material will be indexed to determine whether this treatment has succeeded.

An attempt to identify an unusual leaf flecking condition on pears from Orange has progressed. The condition has been transmitted to one of the indicator hosts. Further observations will be made next season.

This season, inoculations were done to determine the virus content of:—12 Grany Smith apple trees recommended as sources of budwood for nurseries; two Northern Spy apple rootstock clones; Packhams pear trees showing symptoms of bark fissuring; and pear trees showing an unusual leaf flecking. Work was also initiated to determine the reaction of pears to some apple viruses. Results from these experiments will become available during the next two seasons.

Orchard surveys have led to elimination of several budwood source trees from lists supplied to nurserymen. Replacement trees have been selected where needed.

DISEASES OF STONE FRUIT

Brown Rot (Sclerotinia fructicola).—In a field experiment at West Pennant Hills there was no significant brown rot infection difference between Shanghai Seedling peaches sprayed with 0.075 per cent dithianon, 0.1 per cent captan, or 0.1 per cent captan plus triton B1956 (2 fl. oz to 100 gal.). Infection level was 0.9 per cent, 2.2 per cent and 2.7 respectively. Each treatment was significantly superior to no treatment (11.5 per cent brown rot).

In a previous experiment 0.1 per cent captan was significantly superior to 0.1 per cent captan plus triton B1956. The less favourable infection conditions this season prevented confirmation of that result.

Virus Diseases of Stone Fruit.—Tests for transmission of a number of suspected virus diseases were continued at Narara. Inspections this season showed transmission of cherry rugose mosaic virus from the test plant to the indicator stock. There was no evidence of transmission of any of the other suspected virus diseases being tested.

Investigation of the problem of cherry dieback on Mahaleb stocks continued. Suitable stocks have been inoculated to ensure virus infection. In a collaborative experiment with Division of Horticulture these stocks will be used as a source of the virus or viruses involved.

Further results from the indexing of 13 recommended cherry budwood-source trees, on peach and F12/1 cherry seedlings, show that all are virus infested. Heat therapy will be used to attempt to obtain virus-free material.

This season seven more cherry trees were indexed on nine virus-indicator hosts. This will enable more accurate identification of the viruses present in the recommended trees.

The Deciduous Fruit Trees Improvement Committee continued. Inspection of recommended budwood source trees led to rejection of some, and selection of replacements.

DISEASES OF GRAPEVINES

Downy Mildew.—The abnormal, dry conditions resulted in almost no development of downy mildew. No result could be obtained from a Spray Demonstration Trial at Orchard Hills.

Phytophthora Root Rot.—In a glasshouse test of *Phytophthora*-susceptibility of a number of *Phylloxera*-resistant grape rootstocks and scion varieties, Du Lot was the most susceptible. The test also showed that several scion varieties were susceptible to *Phytophthora* root rot.

The severe root rot of Du Lot seen in the field was not duplicated in the glasshouse. Thus, testing of varietal susceptibility must be repeated before any definite conclusion may be drawn.

Although this was a dry season, *Phytophthora cinnamomi* killed a number of rooted cuttings and destroyed roots on some of the remainder of Du Lot cuttings being rooted in a planting at the Horticultural Research Station, Narara, for sale.

Dead Arm (Phomopsis viticola).—After winter application of fungicides in a dead arm spray control trial at Griffith, leaf and cane infections did not occur in the spring of 1964. However, in the 1964-65 season a few vines in the trial have shown leaf and cane infection. This has been insufficient for any conclusion.

The fungus caused severe cane infections on Pedro and Grenache and some bunch-stem infection of Grenache in the Corowa district.

Grape Bunch-Stem Dieback.—This condition has been almost absent for the past three seasons. Further work on vine nutrition has failed to show any difference in nutrient levels between vineyards at Orange, where the condition has occurred, and vineyards at Orchard Hills where it has not.

DISEASES OF TROPICAL FRUITS

Banana Diseases.—The past season did not favour banana diseases. Bunchy Top incidence remained low. Conditions were too dry for leaf spot outbreaks. Amongst market disorders of the fruit, arsenic injury was the most notable.

An attempt was made to assess the relative merits of maneb and salicylanilide dips for black-end and squirter control, but the incidence of each disease was so low that the experiment now awaits a more favourable infection period.

The heart rot condition that has occurred on some farms near Coff's Harbour is still under observation. It has not spread to other farms. Its cause remains undetermined.

Passion-fruit Fusarium Wilt.—Collaborative with Division of Horticulture, the breeding programme to combine field resistance of *Passiflora edulis f. flavicarpa* with the desirable agronomic characters of the black passion vine (*P. edulis*) was continued.

Seedlings from selfed F_4 generation plants were raised. These were inoculated with *Fusarium oxysporum* f. *passiflorae* prior to planting out at North Kulnura in infested soil, mid December, 1964. Very little growth has occurred in the unfavourable season. But losses of young plants have been negligible. Heterogeneity will be considerably reduced by selfing, and a study of character inheritance within present selections will lead to selection of a promising line.

DISEASES OF STRAWBERRIES

Block Root Rot.—At Narara, none of several soil treatments under test controlled black root rot. But three yielded significantly beter than the untreated control.

Ethylene dibromide combined with pentachloronitrobenzene gave significantly higher yields than each other treatment; pentachloronitrobenzene combined with 1:2 dibromo-3-chloropropane, and ethylene dibromide alone, gave significantly higher yields than the untreated control, the pentachloronitrobenzene alone, and the sodium methyl dithiocarbamate.

Recent isolations from strawberry roots showing black root rot have consistently yielded several *Rhizoctonia*-like fungi that are culturally distinct.

Pathogenicity tests of a number of fungi isolated late in 1963 have shown that two different *Rhizoctonia*-like fungi are capable of attacking strawberry roots. One causes rapid death of roots. The other appears to exist in a mycorrhizal type of relationship.

DISEASES OF ORNAMENTALS

Gladiolus Diseases.—Basal rot of corms and the yellows disease (*Fusarium oxysporum f. gladioli*) caused considerable losses for some commercial growers in the Sydney area.

A modified, hot-water treatment to free cormlets from infection has been used. This treatment depresses cormlet germination to various levels—depending on degree of dormancy and on variety. But it eliminates fungus infection. It is a useful, practical method of clearing planting stocks.

Aerated Steam Treatment of Seeds.—In preliminary experiments with aerated steam to eliminate seed-borne pathogens the results are promising. More work has to be done before a recommendation is made.

Cymbidium Mosaic.—Mosaic of Cymbidiums is the most commonly observed disease of these orchids. Several interceptions of this disease have been made, in orchids imported from overseas.

Powdery Mildews (Oidium spp.) *of Ornamentals.*—Powdery mildews were quite severe on several ornamental plants in spring and summer.

Foliage Scorching.—Sun-scorching and damage due to excessive salinity of water was observed in the foliage of many ornamental plants this year. Severe drought conditions in most parts of the State were basic to widespread occurrence of these disorders.

Biology Branch—Bacteriology Section

SOIL BACTERIOLOGY

Soil bacteriology this year was confined to laboratory investigations of peat inoculants. Pressing problems await investigation in the field. Failure to fill an establishment to handle these problems has seriously retarded seed inoculation research in problem areas.

Rhizobium Field Research Committee.—This committee was constituted to report to the Chief Biologist on all aspects of field research involving rhizobia. It includes a representative from Division of Plant Industry and a representative from the Agricultural Research Station, Tamworth. The soil bacteriologist is convenor.

The committee approves or suggests amendments to proposed field trials, organises officer co-operation within the Department and approves recommendations for inclusion in extension material.

Testing Commercial Legume Inoculants.—Two surveys of the quality of legume inoculants as purchased in New South Wales were conducted.

A large proportion (33 per cent overall) failed to meet the higher standards imposed in 1963-64. This was particularly so with rhizobia for summer legumes (61 per cent), compared with rhizobia for temperate legumes (25 per cent). Again these results seem to reflect current difficulties of survival in peat.

Growth and Survival of Rhizobia in Peat Culture.—This project continued. Servicing the investigation with equipment and technical assistance was made possible by financial support from the Australian Cattle and Beef Research Funds.

The peat beds at Mt Gambier were surveyed, and four distinct peat types were found. Three of these have been used in commercial manufacture of inoculants. Differences in the abilities of these peats to allow rhizobial growth and provide for satisfactory survival have been established. Within the one type of peat, differences in suitability for inoculant use occurred with depth of sampling. These differences occurred with all strains of rhizobia tested.

Cultures in the early 1950's were prepared with moisture content of about 20 per cent. Gradually this has increased. Now most peat cultures are produced at about 45 per cent and some as high as 55 per cent moisture content. Growth of rhizobia in peat at 30, 40, 50 and 60 per cent moisture have been compared. A clear preference for 40 and 50 per cent showed, with all strains. At this moisture content, too, contaminant organisms were also at a maximum.

Bags to be used in packaging have been compared. No significant survival difference was found as between using bags of 0.001 in, 0.002 in and 0.003 in polythene film.

DAIRY BACTERIOLOGY

Cheese Starter Cultures.—The Section continued to supply lactic acid starter cultures to the N.S.W. dairy products industry. Requests for 1487 cultures were met this year. In addition to the strains of *Streptococcus lactus* and *Streptococcus cremoris* normally used for cheddar cheese manufacture, requests for starters for cottage cheese, yoghurt and cultured buttermilk increased.

Diversification of cultured products manufacture increased, with country dairy factories starting to make cheeses other than cheddar. Cottage cheese production in particular has increased. Both the American and the European types are being made.

Several small manufacturers have adopted use of single and mixed strain starter cultures in a rotation series. This is in place of use of whey from the previous day's manufacture. Quality has improved as a result.

Butter Quality.—Microbiological analysis of manufactured bulk butter (56 lb boxes) consigned from country factories to the central grading floors in Sydney, Granville and Newcastle were regularly done in the main producing months—October to April. Total, casein digester, coliform, staphyloccoccal and yeast and mould counts were performed on 604 butters.

As far as possible, a weekly sample was taken from each N.S.W. butter factory. The results of the analyses, with suggestions for improvement in factory processing and handling of cream and butter, were forwarded to extension field officers and factory managements.

A survey of the biological quality of retail print butter in metropolitan *and* country areas was begun this year. Three separate surveys were done; involving 100, 100, and 88 butters. The results are being used to advise butter processors, distributors and retailers on improved sanitation and handling methods for this class of butter.

Biological, Cheese Quality.—Monthly sampling and bacteriological analysis of all varieties of cheese produced in N.S.W. continued. The information has been valuable for field officers and cheese factory managements in their attempt to improve the hygiene of manufacture to satisfy export standards. Realisation that local should be as high as export quality standards has led to greater emphasis on factory sanitation and milk quality.

Antibiotics in Dairy Produce.—The N.S.W. Pure Food Act was amended this year, to provide for a zero tolerance of antibiotics in milk. Due to increased production of such cultured dairy products as yoghurt and buttermilk, involving use of antibiotic-susceptible lactic acid bacteria, more factories have started regular tests of suppliers' milk for antibiotics.

The Section has provided technical advice to factories on suitable detection techniques and helped to train technologists for this phase of laboratory control.

Nitrofurans use for mastitis control has become more widespread this year. Investigations of the effect of its residual concentrations on acid production by starter cultures continued.

Bacteriophage-Antibiotic Interactions.—A refrigerated, preparative ultra-centrifuge was purchased. The funds were supplied by the Australian Dairy Produce Board. This unit, with equipment for chromatography and turbidimetry, has enabled the start of work on interactions between bacteriophage and antibiotics as affecting the lactic acid streptococci. Bacteriophage races specific for single strain cultures used commercially in Australia are being purified and concentrated. Suitability of a synthetic medium for growth of host cells, in place of skim milk, has been determined.

Extension Services by Bacteriologists.—The role of microorganisms in dairy products quality deterioration was discussed at technical schools with representatives of commercial firms concerned with dairy industry.

Lectures and demonstrations in biology and microbiology were given for the Department of Technical Education, to dairy industry apprentices at residential schools.

An officer of the Bacteriology Section was elected Vice President of the Executive Committee of the N.S.W. Division of the Australian Society of Dairy Technology. He represented N.S.W. in the Federal Council of the Society and acted as convenor of three national committees: education, mastitis, and bacteriological standards.

OTHER BACTERIOLOGY SERVICES

Bacteriological Defects in Canned Foods.—There were several investigations for commercial firms. Sweet corn and dessert pears were involved.

Entomology Branch

PASTURE AND FIELD CROP PESTS

Australian Plague Locust (Chortoicetes terminifera).—The 1963-64 outbreak in the central west continued on a reduced scale. Hatchings were heavy in the Wingadee area of the Coonamble district in September and October. They were more scattered, though significant, between Coonamble and the Warrumbungles. Isolated patches of flying locusts were reported in the Canonba, Milparinka, Molong, Narrandera and Narrabri districts in November. There was no other report of locust activity.

The previous autumn's swarm layings gave rise to the well-defined hopper bands between Coonamble and Wingadee in October. Over the 5,000 acres infestation area there were up to 200 bands, of from 1 to 5 acres. About two-thirds were treated by landholders. Adults from the hatchings scattered widely. The numbers were insignificant after December.

The hatchings south and east of Coonamble were more extensive but less clearly defined. Not much swarming activity occurred until the adult stage in late November. Then loose swarms and small drifting aggregations of locusts formed into three or four dense and relatively large swarms. These moved slowly towards and into the Warrumbungle foothills. The bulk were aerially sprayed in early December. But some egg laying occurred.

Drought conditions prevailed from December, 1964. A significant second locust generation was not produced. In general, numbers were very low by autumn. Hatchings of consequence are unlikely next spring.

The Wingadee area was aerially surveyed in October. It offered good prospects for spotting hopper bands from the air, because of the bands' good definition and the distinct areas of pasture damage caused by their march. The method was very successful under the conditions. Over 100 bands were located. Aerial spotting of bands could help in a campaign. In future outbreaks, infestation definition from the air, and directing of ground parties to danger areas, will be attempted.

A one-week aerial spraying campaign, including prior assessment of swarms, was done in early December. This was east of Baradine and near the junction of the Coonamble and Coonabarabran Pastures Protection districts.

Two features of this campaign are noteworthy. The first was use of air to ground radio. A v.h.f. set was supplied by the spraying contractor. It provided communication between a scouting car and the pilot during spraying. It saved time and money, and increased the efficiency. All future aerial spraying units should be similarly equipped. The second feature was exhaustive assessment of locust mortality, for one swarm. This has only been done on a few previous occasions; usually cursorily, due to time and staff limitations.

Normally, the adequate assessment of aerial spraying results is very difficult. In this instance, counts of dead locusts could be made over a recognisable and well-defined area as the swarm was travelling from west to east along a relatively narrow valley, where it was sprayed.

The size of the swarm during spraying was about 5 miles long by ¼-½ mile wide. The swarm, during flight, comprised relatively narrow but dense main streams of locusts, with offshoots travelling at an angle to the main flight. The streams were linked by flying locusts at low densities.

Paired counts with a wire quadrat of 1 square yard area were taken at three spaced points across the valley, and repeated at intervals of 0.2 miles down the length of the swarm, in a grid or lattice fashion. The pairs of counts were taken to enable an estimate of sampling error. A total of 64 pairs was counted.

Forty-three supplementary counts were also made, specifically in areas where the kills were very heavy. A quadrat of 1 square foot area was used at random within these areas. A scale map of the locality was drawn from measurements taken on the mileage indicator of a vehicle, and the various areas involved were calculated.

Within the main areas, an estimate of the locust kill was 19,600,000 ± 1,300,000; counts for the supplementary areas gave a further 4,500,000 locusts; and thus a total of 24,100,000 locusts within the whole swarm area. Careful inspection revealed little survival after spraying. So, the original swarm is estimated to have comprised about 25,000,000 locusts.

In the operation, 625 gallons of 15 per cent BHC were used; for an estimated kill of 38,500 locusts per gallon. The BHC was applied as a 5 per cent solution in distillate. This can be compared with a swarm estimate made near Trangie in 1963 when the total of dead was estimated to be 4,500,000 and the kill about 14,000 locusts per gallon of 7 per cent BHC (applied as a 3.5 per cent solution). Rough estimates have been made in previous campaigns, under specially favourable circumstances, of kills in excess of 200,000 per gallon but these do not refer to whole swarms.

Obviously, the grade of kill achieved depends not only on the technical efficiency of the spraying, but largely also on original density and size of the swarm. The former, in particular, will vary greatly, even from day to day. This further emphasises the advantages of treating swarms on topographical barriers, where swarm density tends to increase sharply.

The big needs are accurate knowledge of swarm movements and likely behaviour, and precise timing of spraying operations. Any improvements in information service, and streamlining of organisation and procedure, are the factors most likely to give the best return in terms of economy and efficiency.

The cartographic phase of the analysis of past locust records has been completed in the co-operative project with the CSIRO.

A survey of south-west Queensland was done with the CSIRO and Anti-Locust Research Centre entomologists in February and March. This included aerial and ground surveys of the area, as well as detailed field experiments involving mark and recapture techniques designed for estimates of the locust populations.

The study of phase changes continued with measurement of specimens from field collected samples. To date, forty different series have been assembled from a variety of situations. Measurements have been completed for nine of these.

The Locust Patrol Officer commenced duty in May and is stationed at the Research Station, Trangie. His work will enhance the information service now operating through the Pastures Protection Boards, and provide valuable field data for analysis.

Wingless Grasshopper (Phaulacridium vittatum).—Early in the season there were no reports of high numbers or of damage. Dense hatchings were observed at Oberon in November but drought conditions greatly reduced the numbers—with consequent scattering of populations. There was a patchy infestation at Tuena in January, associated with other species including *Austroicetes* sp. and *Gastrimargus musicus.*

Very heavy infestations were reported in the Armidale Pastures Protection district from late January to April. Improved pastures were severely damaged in February in the Walcha district. There, the order of infestations was 30-50 hoppers per square yard over extensive areas; mixed with abundant *Brachyexarna* sp. and *Gastrimargus musicus.* In March, Uralla reported small swarms, widespread. In April, Medowie reported high numbers, mixed with *Oedaleus australis.*

The Walcha area was selected for an aerial spraying trial, using an ultra-low volume spray technique to apply technical-grade, undiluted malathion. In February three areas of improved pasture in hilly country, with scattered tall timber, were treated. A Piper Pawnee plane was used, fitted with boom and low volume nozzles designed in U.S.A. The treated area totalled about 340 acres. Technical-grade malathion (96 per cent) was applied at a calibrated dosage rate of 8 oz of total volume per acre, using 100 feet swaths. The actual amount applied may have been slightly higher, between 8 and 9 oz per acre.

Numbers before and after spraying were compared, using a representative sweep-net sampling technique. This indicated 90 per cent mortalities after one day and 99 per cent after 10 days. The results were *at least* as good as where on previous occasions the most effective materials available and precise ground spraying techniques had been used.

Thus, application of malathion in this way offers great promise for control of wingless grasshopper and perhaps other grasshopper and locust species. In hilly, timbered country it is the only present method likely to achieve results where large areas are infected. The aircraft can operate effectively from above tree height and in winds that would normally halt the operations.

Big economies are possible with this method, compared with use of insecticides at normal dilutions. The cost of insecticide plus application can be so reduced that it should be widely applicable against wingless grasshopper. Other advantages are the reduced hazards, in terms of malathion toxicity and residues.

Spur-throated Locust (Austracris guttulosa).—A July survey in the north-western wheat region revealed dramatic reduction of the high numbers of spur-throated and migratory locusts observed in April, 1964. Early in September a survey confirmed the July observations except for a few sites where numbers were higher.

In late September a shorter survey was done in the Croppa Creek-Tulloona-North Star area, to inspect the sites of special interest. Those where up to 17 locusts were flushed per 100 paces were hillsides with trees and shrubs towards the top of the slope. Many of the female locusts contained well-developed eggs.

The "knobby" hills rising from predominantly flat country could well be oviposition sites. Transects across flat country to the top of one such hill flushed nil locusts for 600 yards, then a few at the start of a slight incline amongst large grass clumps, and finally from 4 to 16 per 100 yards on the hill proper—where small shrubs graded into large shrubs and trees at the top.

A similar hill in a different locality, near North Star, revealed only a few locusts on the hill—with none on the surrounding flat lands. But the whole area had been heavily grazed. The locusts were invariably associated with the few clumps of tall grass available. Height and density of ground cover were still important factors, as previously noted.

In the September survey, the captured locusts comprised two species—*A. guttulosa* and *A. proxima;* subsequently confirmed as valid species with overlapping ranges. *A. proxima* does not extend much further west than the survey area. There are notable behavioural and ecological differences between the species, even though they often occur as mixed populations. Their relative roles in damaging wheat need investigation.

In December the sites that were examined in September were again surveyed, to determine whether they were concentration egg-laying areas. But very dry conditions had prevailed, and the main site had been burned to clear it of unwanted growth. Locust numbers were greatly reduced in all sites and eggs were not located. One female was captured in a condition suggesting that it may have already laid once.

Wheat stem chewing was reproduced under cage conditions at Graman, with locusts collected from the field in September.

Black Soil Scarab (Othnonius batesii).—Analyses of the results of samplings of 13 separate black soil scarab populations in the Graman area from May, 1959 to May, 1965, showed that eight populations have increased and five have decreased. Since May, 1964, populations have increased in two cases, remained stationary in four, and decreased in seven.

No flights have yet occurred in this flight season in the Graman area. Consequently, no eggs have been laid this year—a direct result of drought since December.

Two more gravid female/soil/oviposition trials were conducted in December.

In one of these trials, female beetles were given a choice of five soils: a Graman black earth, a Cooledah black earth (county Napier), a Cooledah black earth (county Cowen), a Goorally black earth (county Leichhardt), and a Croppa Creek grey soil of heavy texture (a brigalow-belah soil). The Graman black earth was by far the most attractive soil.

In the other trial, females were again presented with a choice of five soils: a Graman euchrozem, a Neven grey soil of heavy texture, a Neven brown soil of heavy texture, a Neimbah grey soil of heavy texture, and a Neimbah brown soil of heavy texture. The Graman euchrozem was the most attractive soil.

Eight more control trials were established during the year. In a trial established in April, 1957, a surface application of 8 lb DDT per acre is still exerting a controlling influence on grub numbers, although there was a time lag of 12-18 months before apparent effect. This trial also illustrated that *Phalaris tuberosa* can persist once it is protected from grub attack in the seedling stage.

In a pasture-insecticide trial established in June, 1958, DDT at 4 lb per acre is still exerting a controlling influence on grub numbers, also after a time lag of about eighteen months. Fair *P. tuberosa*-lucerne-native grass pasture is in the DDT plots.

Different formulations of ethyl parathion, methyl parathion and diazinon, all at 0.5 lb a.i/acre, were compared in a wheat-pasture-insecticide screening trial sown in July, 1963. Ranking showed that ethyl parathion was the best material tested. Of the wettable powder, emulsifiable concentrate and granule formulations tested the wettable powder formulation was best. Diazinon emulsifiable concentrate was by far the worst treatment.

Two rates of ethyl parathion 0.5 and 1 lb and two formulations, 2½ per cent attapulgite granules and an ethyl parathion-gypsum mixture (½ lb ethyl parathion per 56 lb gypsum), were applied in a wheat-ethyl parathion trial sown into a badly grub-damaged area in May, 1964. Each insecticide treatment reduced larval numbers; ranging from 75.9 per cent for the 1 lb ethyl parathion treatment to 67.6 for the 0.5 lb ethyl parathion-gypsum treatment, without any significant difference between treatments. At sampling time, dead and dying (affected by insecticide) larvae were found in all plots except the control. So, it is assumed that another sampling would further reduce larval numbers in the insecticide plots.

DDT-parathion treatments, at 1 lb, 2 lb and 4 lb DDT and 0.5 lb ethyl parathion, in a July sown wheat-pasture trial in a black soil scarab infested area not previously worked reduced larval numbers. This was largely due to the 0.5 lb ethyl parathion. Once again, dead and dying larvae were recorded in all insecticide plots, and a later sampling would have shown much greater reduction in larval numbers.

Black soil scarab larvae effect on soil fertility was studied in pot trials at Hawkesbury Agricultural College. Soil samples were collected from grub patches at Nevertire and Graman and compared with soil samples taken immediately outside the patches. Of the four pairs of soils compared for the after-effects of scarab infestation, three were found to give less vigorous growth after infestation than before, while one showed no effect on vigour. The only other differences found were on the Robard (Nevertire) soil. In this case, infestation appears to have induced mild zinc and boron deficiencies. The major effect then seems to have been one of reduced soil structure, with probable accumulation of stomach juices on the crust which normally occurs in these patches.

Pruinose and Related Scarabs (Sericesthis pruinosa *and* Rhopaea spp.).—Scarabaeid damaged pastures on Shannon Vale Nutrition Station were inspected in May. Pastures, especially cocksfoot, all showed heavy damage. In some paddocks 50 to 60 per cent of the cocksfoot plants were dead, just sitting on the surface with all roots chewed off.

Anoplognathus porosus, Sericesthis pruinosa, S. suturalis, Anodontonyx sp., *Rhopaea* spp. (three species), a Dynastid sp., and an unidentified sp. were collected from the pastures. The *Rhopaea* spp. were very numerous and the main economic concern.

One cocksfoot pasture virtually completely destroyed by *Rhopaea* spp. was adjacent to a *Phalaris tuberosa* pasture. In the *P. tuberosa* pasture there was some very minor damage to plants adjacent to the cocksfoot pasture (to a distance of 2-3 yards in from the fence), but no damage over the remainder of the paddock. Migration of larvae into the *P. tuberosa* pasture, from the cocksfoot pasture, was assessed as the explanation.

Wheat Root Scarab (Anodontonyx noxius).—Two insecticide control trials against wheat root scarab larvae were conducted between August and October at Tamworth.

The first trial compared the organochlorine compounds heptachlor, BHC, chlordane, aldrin and DDT, and the organophosphorus compounds diazinon, ethyl parathion and E.I. 43064, at two rates of application—0.5 and 1 lb a.i./acre.

The second trial compared heptachlor, BHC and aldrin, and diazinon and ethyl parathion, at 2 and 4 oz a.i./acre.

Both trials were sown in a wheat crop into areas where the wheat plants had been killed out by larvae. Results from the first trial indicated that diazinon, heptachlor, ethyl parathion and E.I. 43064 were promising materials. In the second trial diazinon 4 oz a.i./acre was the most promising.

Black Beetle (Heteronychus arator).—Reports of black beetle damage this year have been more numerous than for some time. This can be correlated with the very dry conditions. Slight damage to odd vegetable crops was reported in December at Taree and from February to April moderate numbers caused some damage to maize. Death of areas of paspalum and kikuyu up to ¼ acre was also attributed to this pest. Damage to small localised pasture areas was reported in February, especially on hill country at Grafton. The beetles were reported from December to May in Albury and swarmed in mid-February.

White-fringed Weevil (Graphognathus leucoloma).—In the spring, pastures at Taree, in December, lucerne at Maitland and, in February, new lucerne areas at Gunnedah were damaged by white-fringed weevils. Tropical summer legumes, *Desmodium uncinatum* and *Glycine javanica* were damaged at Nambucca in late summer and autumn, as were beans and peas in the Macksville district in April. Adults appeared earlier than usual at Taree, in October, and were unusually numerous in the autumn in the Taree, Maitland and Nambucca districts.

Compared with adjacent untreated areas, larval numbers were reduced in lucerne stands at Cowra treated with dieldrin at 1½ lb a.i. per acre in August, 1959, prior to sowing in September, 1959; also at Canowindra where treated at 0.9 lb and 2 lb a.i. per acre in December, 1960, prior to sowing in April, 1961.

At Cowra the result was 1.33 grubs per square foot in the untreated and 0.1 in the adjacent treated area. Considerable root damage was observed in the untreated area, but practically none in the treated. This was so also at Canowindra, where the result was 0.05 grub per square foot in the treated area compared with 1.1 in the untreated. The 0.9 lb per acre application has been as effective as the 2 lb rate.

Of the three sowing treatment trials in the Manning River district, larval infestation occurred only in one. The number of *G. leucoloma* larvae in the untreated area was double those in areas treated with aldrin and dieldrin at 2 lb a.i. per acre.

Promising results were obtained with 0.1 per cent supracide, 0.1 per cent azinphos ethyl, 0.1 per cent endosulfan and 0.1 per cent cabaryl in a screening trial at Valla against adult weevils when the populations were declining after causing severe foliage damage to the tropical summer legumes.

Lucerne Flea (Smynthurus viridis).—The pest damaged a lucerne stand at Muswellbrook in August. It is the first record from the district.

At Lake Wyangan, near Griffith, an inspection in late August showed that two applications of diazinon (1 oz a.i. per acre on 1st May, 1964, and ¾ oz a.i. per acre on 5th June, 1964) to infested lucerne and sub-clover were not enough to eradicate lucerne fleas.

Bloodworms in Rice (Chironomus sp.).—Rice seed treated with DDT at 2 and 4 oz a.i. per 100 lb of seed was protected against bloodworm attack in experimental sowings.

Several of a series of 18 organophosphorus compounds gave promising protection of the seed when used similarly to DDT. Plant establishment and yields were better. However, germination was severely affected by some treatment.

Farmers' trial sowings of seed treated with DDT 2 oz a.i. per 100 lb of seed gave varying results. These were partly because of fungal attack in early sowings.

In a trial at Yanco Agricultural Research Station in cooperation with rice agronomists, better plant establishment was obtained with several fungicidal and insecticidal dressings. All treatments (except methyl cellulose only, the adhesive) gave significantly better results than did no treatment, in plant establishment numbers and eventual yields.

Clover Root Weevil (Amnemus spp.).—Clover root weevil larvae were active in clover and subtropical legume pastures in north coastal areas in winter, and considerably damaged the latter.

Azinphos ethyl (1 lb a.i. per acre), trichlorphon (1 lb), methoxychlor (1 lb) and carbaryl (1 lb) were all ineffective against clover root weevil infesting ladino clover pastures. In earlier work, endosulphan and diazinon had also been found ineffective. DDT and lindane, for which there is some tolerance in meat products but none in milk, are now being assessed.

This was the third year of the Wollongbar experiment established in collaboration with Division of Plant Industry, to determine whether insecticidal control of clover root weevil is needed in appropriately grazed subterranean clover pastures. Counts of weevil larvae confirmed previous results, that heavy January and February grazing obviates the need to use insecticides against clover root weevil in subterranean clover.

Slugs (Agriolimax sp.)—These were again serious in seedling and established clover and other legumes in north coast pastures.

Bordeaux mixture 1:1:80 and 1:1:40, copper oxychloride 4 lb per acre, metaldehyne 4 lb and 8 lb per acre, carbaryl 0.1 per cent (all applied at 100 gal. per acre), and dehydrated copper sulphate 1 part with hydrated lime 10 parts at 45 and 90 lb per acre), have been assessed for slug control. The experiment was in established ladino clover pastures at Byrrill Creek.

Each treatment initially reduced slug numbers, but the effect was there only for a few days. Copper oxychloride reduced slug numbers by 57 per cent seven days after application. This was the most effective of the materials tested.

Pest Survey of Tropical Pasture Legumes.—A survey of the insects occurring on the tropical summer legumes *Glycine javanica, Desmodium uncinatum, D. intortum, Lotononis bainesii, Dolichos lab lab* and Siratro was continued on the north coast.

Larvae of the clover root weevil (*Amnemus* sp.) severely damaged the roots in many crops of *D. uncinatum* and *G. javanica* in the Richmond-Tweed area in late winter and the spring. Under the drought conditions prevailing, plants were unable to replace damaged roots in the extremely dry soils. Many small areas of these crops were totally destroyed.

Adult white-fringed weevil (*Graphognathus leucoloma*) occurred in plague numbers in the Nambucca district in late summer and autumn. This caused very severe foliage damage to *D. uncinatum* and *G. javanica.*

Flea beetles (*Halticidae*) feeding on the foliage of seedlings were the most important pests in young stands of the tropical legumes, but in some areas swarming monolepta beetles (*Monolepta australis*) severely damaged *D. uncinatum* foliage.

Unusual pests of *D. intortum* were green scarab beetles (*Diphucephala* sp.). In an experimental area at Tweed Heads these attacked only *D. intortum.* They did not affect *D. uncinatum, L. bainesii* or Siratro. Heliothis caterpillars were less prominent than usual in seed crops. Their activity was probably restricted by drought conditions.

Funnel Ant (Aphaenogaster pythia).—This is a serious pest of pastures in localised north coast areas. Under wet conditions ants build large mounds which cover and kill grass and allow weeds to invade the pasture.

Heptachlor granules, 6 lb and 9 lb a.i. per acre, were tested against this pest at Murwillumbah. Ant population was drastically reduced by the 9-lb rate, but local eradication was not achieved and eventually some further mound building occurred. Declorone (kepone) and mirex baits were also tested on a limited scale. These showed some promise.

Armyworms and Cutworms (Noctuidae).—Cutworm and armyworm activity has been light, particularly in the coastal areas. Outbreaks of bogong moths (*Agrotis infusa*) were reported in the Hay-Roto area in spring, where the legume component in pastures was damaged. Some reports of southern armyworm (*Persectania ewingii*) were received from Moss Vale, Harden, Walcha and Wallerawang on the tablelands. An outbreak of brown cutworms (*A. munda*) occurred in a gladioli crop at Oakdale in February. One outbreak of northern armyworms (*Pseudaletia convecta*) attacking wheat was reported from Rowena in November.

Continuation of life history studies on the tobacco cluster-grub (*Prodenia litura*) revealed that within three days after emergence from the pupae adult moths mated and the females commenced ovipositing. Egg laying occurred over a period of two to nine days, with total egg numbers ranging from 625 to 1,575 eggs per female. Hatchability ranged from 1 per cent to 66 per cent, with an average of 38 per cent. In most cases female moths died within two to three days of producing the last egg batch. Life span of the females was seven to fourteen days and the males fourteen to twenty-one days.

The effects of glucose, water, and no food, on longevity, number of eggs per female and percentage hatchability of the eggs were studied. Moths fed glucose produced more eggs and laid them over a longer period than in the case of the other two treatments. Immersing eggs in water showed that eggs immersed for longer than two days failed to hatch. Eggs immersed for one and two days had hatchabilities of 47.5 per cent and 5 per cent respectively. Eggs subjected to a temperature of 40° F. for one day had a hatchability of 45 per cent compared with the control's hatchability of 80 per cent. Eggs exposed to 40° F. for longer than one day failed to survive. Three months later, eggs at varying stages of development, ranging from newly laid to three days old, were exposed to five different temperatures: 40° F., 70° F., 80° F., 100° F. and 118° F. No hatching occurred at 40° F. on this occasion, nor at 118° F. Maximum emergence occurred within the 79-80° F. range. At 100.2° F. only eggs three days old kept at 80° F. hatched.

Pupae were found to survive for up to eight days at 40° F., with 20 per cent emergence.

Clover Case-Bearer (Coleophora sp.).—Parathion at 6 oz a.i. per acre controlled clover case-bearer larvae in a screening trial in 1963.

This year, bidrin, DDT, parathion, fenitrothion and endosulfan were applied at two rates, 3 oz and 6 oz a.i. per acre, except DDT. The DDT was applied at 1 lb and 2 lb a.i. per acre. The treatments were applied at three intervals, about three weeks apart. Counts of moths and of larvae indicated that parathion and fenitrothion, each at 6 oz a.i. per acre, controlled this pest for at least three weeks; bidrin at 6 oz a.i. per acre also gave good control but was inferior to parathion and fenitrothion.

Time of application was shown to be important, as percentage mortality decreased when the larvae entered the case form. Also, it appeared that more than one spray is needed to protect the crop until harvest.

Red-legged Earth Mites (Penthaleus major *and* Halotydeus destructor).—Red-legged earth mite (*Halotydeus destructor*) populations were very heavy in the late winter and early spring. They severely damaged improved pastures. Cold and wet weather in July caused a marked decrease in numbers, but the populations increased rapidly with the advent of more favourable mid-August weather.

Lack of autumn rains in 1965 confined the mites to irrigated pastures in many areas. *H. destructor* in the southern areas was present in moderate to large numbers. *P. major* populations appeared in March in the Muswellbrook area on irrigated pastures. This is earlier than usual. They increased rapidly. mainly attacking oats.

A surface application trial was started in June, 1964, at Wagga. This was to test various materials as alternatives to DDT for control of red-legged earth mites in pastures where residue problems exist. Azinphos ethyl, bidrin, cidial, DDT, dimethoate, imidan, formothion, binapacryl, fenchlorphos S. 4706 and S.J.S. 101 were used. Azinphos ethyl, imidan and dimethoate, each at ½ oz a.i. per acre, were found to be valuable alternatives. They gave six weeks protection. The outstanding superiority of DDT at rates as low as ½ oz and 1 oz a.i. per acre confirmed the results of 1962 and 1963.

A trial of the effectiveness of malathion low volume concentrate against *H. destructor* was begun at Darlington Point in May. The insecticide was applied by aircraft at four rates, 2.0 oz, 2.7 oz, 4.0 oz and 8.0 oz a.i. per acre. After three weeks some control was being achieved with the 4.0 oz application.

A further trial was established at Muswellbrook during the week of 15th-18th June, against *P. major* on irrigated pasture. Eight insecticides, bidrin, fenitrothion, thiocron, formothion, azinphos ethyl, chlorpropylate, diazinon and phenkapton, were applied at ½ oz a.i. per acre. After 36 hours azinphos ethyl, diazinon and bidrin had given good initial kills. Observations will be continued.

Cotton Insects.—Infestations at Narrabri were generally much lighter than in previous years, probably because of the dry conditions.

Counts of common bollworm (*Heliothis* sp.) caterpillars and damaged buds and bolls showed that two or more caterpillars per 10 feet of row cause economic yield loss. Infestation at Narrabri reaches a peak while the cotton is flowering most prolifically, and continues over three or four weeks. Observations showed that whilst ovipositions and hatchings are continuing it may be necessary to repeat DDT sprayings at five-day intervals to minimise losses.

Rough bollworms (*Earias huegeli*) were fewer than in previous seasons. This is thought to be due partly to the effect of the drought on its alternative host plants, notably bladder ketmia (*Hibiscus trionum*), and also to growers' greater awareness of the pest. This awareness has led to greater use of programme-spraying with endrin.

Heliothis moths were numerous nightly from the start of trapping (light traps) in early December to mid-March. Then activity ceased abruptly. On the other hand, few *Earias* moths were about until mid-February. Thereafter significant numbers were trapped almost nightly until 11th June.

In a Narrabri trial seven spray applications at approximate ten-day intervals from 25th February and 13th May of carbaryl (15 oz a.i. per acre), azinphos ethyl (6 oz), endrin (4 oz and 8 oz), endosulfan (9½ oz) and toxaphene (2 lb), were compared for effectiveness against rough bollworm. Carbaryl and azinphos ethyl appeared to be more effective than endrin, and will be in next season's recommendations for programme-spraying. Endosulfan and toxaphene were of little value. The results did not indicate that the 8 oz rate of endrin was significantly better than the 4 oz rate.

Endosulfan (8 oz a.i. per acre) and endrin were the best of the abovementioned treatments against cotton aphids (*Aphis gossypii*) which fairly heavily infested the experimental plots in April and May.

Red spiders (*Tetranychus urticae* and *T. ludeni*) infested cotton crops at Narrabri and were controlled by demeton-S-methyl at 4 oz a.i. per acre.

FRUIT TREE PESTS

Red Spider (Tetranychus spp.).—Further observations on overwintering habits of red spiders in orchards at Orange generally confirmed that almost the whole overwintering population remains inactive under shelter on or adjacent to the trees from June to late August, but a very small proportion was observed feeding on herbage.

All overwintering spiders, in shelter or on herbage, were orange-red adult females. Investigations at Rydalmere have indicated that these enter the orange-red, overwintering phase in a fertilized state and that their activity is readily resumed in suitable, glasshouse conditions. It is therefore doubtful that the species has any real period of diapause.

Large numbers of the spiders emerged from shelter in the milder conditions of the fourth week of August. They began to feed on herbage and lay eggs on sub-clover and less so on other herbage. They retained their orange-red colour, but developed side markings.

During September feeding activity on herbage increased. By late in the month nearly all had vacated winter quarters and moved onto herbage. They were also on young apple shoots. Egg-laying on chickweed and sub-clover was heavy Hatching started about mid-September. Those on the unfolding leaves of apples in late September had little, if any side markings. This indicated recent migration, direct from winter quarters.

Two identical experiments were started in July at Orange to determine whether the build-up of red spider on apple trees during the summer could be significantly delayed: *firstly*, if the trees were cleaned of spiders' shelter, butt-sprayed with dormant oil immediately afterwards, then banded a few days later with a sticky banding material; *secondly*, by similar treatment except that the trees were not banded; and, *thirdly* if the trees were not cleaned of shelter or sprayed with oil, but with trunks banded. Build-up of red spider populations was slow and results of these winter treatments were not encouraging from a practical viewpoint.

Investigation of indifferent red spider control with tetradifon in the Orange district during the year suggested that inadequate application methods were responsible in one case. The results in another case suggested the build-up of resistance. This is being examined further.

In the Murrumbidgee Irrigation Area red spiders were again a major pest of stone and pome fruits in the hot, dry summer. Early summer control was effective, but the main summer increase of these mites caused concern. Miticides including dicofol, carbophenothion, chlorpropylate and binapacryl satisfactorily controlled the pest when applied to the rapidly expanding population thoroughly and timely (two sprays within ten days).

Two trials were established, one at Griffith, the other at Leeton, to demonstrate effective suppression of red spider populations. Carbophenothion effectively controlled the mites in a Griffith apple orchard where dicofol was unsatisfactory. Binapacryl gave as effective control as dicofol in the Leeton peach orchard, where at the same time drive-past methods were shown to be unsatisfactory.

Resistance to acaricides has been recorded in New South Wales for only one species of mite—the two-spotted mite (*Tetranychus urticae*). A comparison between resistant and non-resistant strains of *T. urticae*, of egg production, ratio of males to females in the progeny, and rates of development, showed that the differences in numbers of eggs produced and ratio of males to females in the progeny were not significant. Times from deposition of eggs to hatching and to development of mature adults were the same for all of the strains observed.

Size differences of the adult females of *T. urticae*, *T. ludeni* and *T. lambi*, which most frequently occur as pests in New South Wales, were recorded.

In a survey of the host range and distribution of the spider mites in New South Wales, the two-spotted mite (*T. urticae*) was recorded from the districts of Albury, Armidale, Batlow, Kentucky, Luckrow, Martinsville, Murrumbidgee Irrigation Area, Narrabri, Narromine, Orange, Sydney, Tamworth, Wellington and Young, and on apple, boysenberry, buffalo grass, cotton, dwarf bean, loquat, mango, marshmallow, peach, pear, plum, prune, rose, snowball, strawberry, violet and walnut. The red-coloured *T. ludeni* was recorded from Gosford, Narrabri, Sydney and Windsor on citrus, cotton, crotolaria, cucumber, dwarf bean, horseradish, pumpkin, purple top weed and yellow weed. *T. lambi*, also a red-coloured spider mite, was recorded from Carool, Drydock, Dungog, Murwillumbah, Tullera and Wardrop Valley on banana and on *Glycine javanica* and vetch. *T. hydrangeae* was found on hydrangea at Gosford and Sydney.

Oriental Fruit Moth (Cydia molesta).—This year the moth caused only minor damage to the canning peach industry in the Murrumbidgee Irrigation Area. The very dry summer, and widespread use of petal-fall sprays, were major factors in the pest's decline. Azinphos and carbaryl, the two major insecticides used against this insect continued very satisfactory control.

The small amount of damage affected the results in insecticide timing trials. Use of improved wetter and spreader did not increase the azinphos and carbaryl control of larval attack of peach fruit.

Dried Fruit Beetles (Carpophilus spp.).—Records were maintained of adult dried fruit beetles trapped in Murrimbidgee Irrigation Area peach orchards. Catches were high in the spring, early summer, and later in the summer just before peach ripening.

Trapping was tested as a control method. Special two-gallon containers of diluted golden syrup as lure in each treated tree were used in a block of Pullars Cling peaches. Fruit damaged were too few for evaluation of the method. Damage to peaches or apricots in the Murrumbidgee Irrigation Area generally was insignificant.

Vine Mite (Brevipalpus lewisi).—Ethion 6 per cent-in-oil, 1 gallon in 80 gallons of water, applied in the early woolly-bud stage of Black Muscat grapevines, was equivalent to lime sulphur 1 in 20 in contrrolling vine mite. Other treatments, including ethion 6 per cent-in-oil 1 in 100, carbaryl 0.1 per cent plus oil 1:100 and carbaryl 0.1 per cent plus 3 ounces wetter, yielded results no better than those of the untreated.

Vine Leaf Blister Mite (Eriophyes vitis).—Assessment of the value of lime sulphur 1 in 20, carbaryl 0.1 per cent plus 1/100 oil, ethion 6 per cent-in-oil, 1/80 and ethion 6 per cent-in-oil 1/100 and 0.1 per cent carbaryl plus 3 oz wetting agent in controlling this mite showed that the first three performed well.

Red Scale (Aonidiella aurantii).—Final assessments in the 1963-64 red scale trial in the Murrumbidgee Irrigation Area, of treatments applied only in February, showed best control by dimethoate w.p. 0.03 per cent plus white oil 1/100 and ethion 6 per cent-in-oil at 1 in 80. These are standard recommendations. Ethion at the reduced rate of 4 per cent in oil at 1 in 80 was equally effective. Some new organic phosphates, bidrin 0.04 per cent plus white oil 1/100, cidial e.c. 0.05 per cent plus white oil 1/100 and mecarbam 6 per cent-in-oil at 1 in 80, were effective, but showed no promise of superiority to the standard recommendations. The mecarbam-in-oil formulation caused some fruit blemishing. Another organic phosphate, fitios e.c. 0.05 per cent plus white oil 1/100, was ineffective. Carbaryl w.p. was unsatisfactory at both 0.1 per cent plus white oil 1/100 and 0.12 per cent plus white oil 1/100.

This trial also re-confirmed that single spray applications are not sufficient under severe infestation conditions.

Assessment of a pilot trial at Yanco showed good results with formothion e.c. 0.05 per cent plus white oil 1/100. Sumithion e.c. 0.05 per cent plus white oil 1/100 was less promising.

White Wax Scale (Ceroplastes destructor).—Experiments at Narara and Kulnura this season showed that carbaryl can be used successfully for white wax scale control up to a few weeks after the timing (full emergence of larvae) which is standard for control with white oil alone. Strong stimulation of purple scale by carbaryl spraying in December, 1963, was seen this season at Narara. This was on Valencia oranges that were moderately infested with purple scale at the time of carbaryl use.

In a pilot trial in April, 1963, sprays of "dipping oil" (mainly ethyl oleate, used to improve sultana drying) had given good kills of adult white wax scales. This year the results from "dipping oil" used against wax scale larvae in January were not encouraging.

Brown Olive Scale (Saissetia oleae).—Good results have been achieved by spraying with carbaryl plus white oil when most of the scales are in the young larval stages. Carbaryl w.p. was applied in January at Windsor, at 0.05 per cent plus white oil 1/100; at Kulnura, at 0.05 per cent plus white oil 1/100 and 0.1 per cent plus white oil 1/100; and at Somersby, at 0.05 per cent; 0.1 per cent and 0.15 per cent plus white oil 1/100. Results with the 0.05 per cent plus white oil 1/100 applications were good.

San Jose Scale (Quadraspidiotus perniciosus).—A number of severe infestations on peaches and apples were controlled with dormant oil 3 gallons to 100 gallons or with carbophenothion or ethion formulated in dormant oils. Late summer applications of carbaryl plus oil gave valuable auxiliary control.

Citrus Gall Wasp (Eurytoma fellis).—Expanded research into gall wasp behaviour and control was commenced in October. This followed discovery of heavy infestation in several acres of Eureka lemon trees at Oxford Falls. The intention is to establish whether this heavy infestation notably affects the growth and cropping of Eureka lemons, and whether commonly used spray materials such as Bordeaux mixture and sulphur repel the adult wasps.

Occurrence of the parasite (*Epimegastigmus brevivalvus*) was studied in Eureka lemon trees at Oxford Falls. In the spring there was about 50 per cent emergence of wasps from cells in the galls. Of these emergences, about 40 per cent were gall wasp and 60 per cent were *E. brevivalvus*.

Parasites (*E. brevivalvus*) bred from the lemon trees at Oxford Falls were distributed in Gosford district near some sites where local elimination of gall wasp has been attempted; although parasites have been bred from gall wasp samples from infested trees found in the district.

A large scale trial of hot-water dipping this season showed that treatment levels likely to give disinfestation were too injurious to nursery trees. EDB fumigation was less severe on the young trees.

Banana Beetle Borer (Cosmopolites sordidum).—Under the summer drought conditions that prevailed on the north coast, banana beetle borer was extremely active and damaging.

In the experiment begun at Tomewin in 1963 (to compare the effectiveness of heptachlor e.c. ½ and 1 lb a.i. per acre, heptachlor 1 lb a.i. per acre as a dust in fertilizer, dieldrin e.c. ½ lb a.i. per acre and fenchlorphos e.c. 1 lb a.i. per acre) dieldrin and the various rates of heptachlor were effective for a little more than two years against beetle borer, but fenchlorphos was completely ineffective. S. 4400, an experimental organophosphorus compound, tested in the fenchlorphos plots at 1 lb a.i. per acre, was also ineffective. Declorone (kepone), 5 per cent dust at 40 lb per acre, currently being assessed, is showing considerable promise.

Macadamia Leaf Miner (Acrocercops chionosema).—Macadamia leaf miners heavily infested young leaves of macadamia in early spring in the Tweed district. They destroyed much of the effective leaf tissue.

Study of the insect's life history and habits continued. There appear to be five or six instars, but determination of the exact number is complicated by variability in the size of head capsules. Mine development takes place rapidly and, within three days of hatching, the larvae tunnel mines of 2 inches or more in the leaves and start the leaf blisters. The leaf blisters greatly reduce the photosynthetic area of the leaf. Control of the pest should aim at prevention of blister development. Azinphos ethyl applied at intervals of two weeks prevents major leaf loss.

Red-shouldered Leaf Beetle (Monolepta australis).—Intense swarming occurred over a long period in late summer. Swarms attacked avocado fruit and foliage, also maize, clover, French beans, and the subtropical legume *Desmodium uncinatum*. Laboratory attempts to breed the larvae beyond the first instar were again unsuccessful. Where this insect breeds in the field is still not known.

Thrips and Peach Fruit Set.—Large populations of thrips were present in peach blossoms and on the leaves right after blossoming in the Murrumbidgee Irrigation Area. Minor injury to the leaves was noted. In a trial on Golden Queen peaches, the thrips were controlled with malathion. But there was no difference between treated and untreated when assessed for fruit set and injury. The insect is of minor importance.

Carbaryl and Peach Fruit Set.—Further trials this spring showed that 0.1 per cent carbaryl applied at full bloom in September to Golden Queen peach trees did not affect peach fruit or growth of the fruit to maturity. On treated trees, 22.5 per cent of the blossoms set fruit which were still on the tree in February. The untreated trees set 21.6 per cent of the blossoms. The difference was not significant.

Queensland Fruit Fly (Dacus (S.) tryoni).—An unusually severe infestation of fruit fly occurred in bananas on the north coast in December. It continued throughout the summer, and coloured fruit left hanging was heavily stung. Green fruit was stung on bunches containing some coloured or diseased fruit, or on bunches near infested peaches or other fruits. No maggot development occurred in stung, hard green fruit. But eggs and maggots were found in coloured and sprung fruit on interstate markets. This resulted in the Governments of South Australia and Western Australia requiring compulsory fumigation of all bananas from New South Wales and Queensland.

Peaches, immature Iona grapes and tomatoes also were heavily infested on the north coast in late spring and early summer. Very immature mangoes were heavily stung and subsequently infested with maggots. Stinging of passionfruit at Alstonville and Coorabell was severe in December. Maggots developed in the soft-skinned hybrid varieties, and also in the standard commercial variety where the skin was damaged through other causes. In the late summer, avocado fruit was heavily stung. At Wilsons Creek, Mullumbimby, 100 per cent loss was sustained on individual trees. Maggots did not develop, but severity of the stinging made the fruit unmarketable. Washington Navels were heavily stung in the autumn and fruit loss was high.

At Gosford, late-hanging Valencias and second crop oranges were infested in March. But fruit fly was generally unimportant in citrus orchards during the season.

On the central western slopes, fruit of *Prunus* sp. planted in the streets of Wellington were infested in late November. This incidence diminished by about mid-December. Infestation was recorded in Dubbo in the first week of December.

Late cherries in the area between Tenterfield and Armidale were infested in the first week of December. This was earlier, for the first wave of fruit flies, than experienced for a number of years. Twenty-ounce apples were also stung, at Uralla in December,

In the Sydney area there was little difficulty in controlling infestations in commercial crops, although light infestations persisted until the end of the pome fruit season. Backyard infestations, though patchy, started in loquats and grapefruit in October and seriously infested many stone fruits in December. Immature grapes were stung in December.

A small trial with caged fruit flies in December showed that the flies were very reluctant to sting hard, green bananas. Bananas which were green but not so hard (sprung) were stung. Mature bananas were stung readily. Implantation of fruit fly eggs into the flesh of hard, green bananas resulted in no larval development. Larval development in more mature bananas followed similar artificial infestation.

Building Fruit Fly Populations at the Wastage Research Laboratory

This year the work provided amongst others for a series of trials to build up a total of 100,000 fruit flies killed in artificially infested pears by cold storage at 33° F. for fourteen days—with no survivors. Affecting fruit export trade, the U.S. Department of Agriculture requires satisfaction of this test of the treatment's efficiency.

A preliminary study of EDB fumigation of bananas was carried out; at dosage rates of 8, 10, 12, 14 and 16 oz EDB per 1,000 cubic feet for 2 hours at 70° F. in February. Populations of 500 to 1,000 fruit fly larvae in artificially infested mature fruits were killed by each dosage rate, with no survivors. EDB residues in hard, green bananas were high ½ hour after fumigation, but had declined to a very low level twenty-four hours later. Skin injury to the hard, green bananas was of little consequence. A most significant effect of the fumigation treatments was that they caused the fruit to colour and ripen within a few days. It is not known whether this important effect was due to the EDB itself, or to some other conditions during fumigation.

The recommended schedule, of spraying for fruit fly control at four and three weeks before harvest with either fenthion or formothion at 0.04 per cent a.i., did not cause acute phytotoxicity this year to an early maturing peach crop. The trial was designed to evaluate phytotoxicity where two spray concentrations of fenthion and formothion and two spray timings were compared. Some signs of phytotoxicity had been noted last year with the fenthion spray schedule. A single application of 0.04 per cent supracide a.i. caused acute leaf-drop in the early peaches, but not in mid-season peaches.

EDB fumigation studies with lemons and mandarins were continued. Sufficient data were gained to complete investigations with mandarin varieties other than Ellendales. Artificially infested Emperor mandarins were used in a series of thirteen trial fumigations at 70° F. with 14 oz and 18 oz per 1,000 cubic feet dosage levels. With the 14 oz dosage there were 20,018 larvae killed and no survivors. With the 18 oz dosage there were 17,355 larvae killed and no survivors. Natural mortality in non-fumigated control fruits was 4.05 per cent. Investigations last season had shown Emperor and Beauty of Glen Retreat mandarins to be quite tolerant of EDB fumigation. A large, survey-type trial in July showed Ellendales to be rather susceptible to rind injury by EDB.

Some slight susceptibility to rind injury by EDB was seen in a large, survey-type experiment on Eureka lemons in June. But when the experiment was repeated in September no susceptibility was observed.

Experimental work aimed at proving to United States Department of Agriculture standards, Queensland fruit fly disinfestation in pears was continued. Analysis of the 1963-64 results of the experiment wherein artificially infested apples stored at 33°F. were the media, indicated fourteen days to be a suitable storage period for probit nine larvae mortality (thirty-two survivors allowed per million).

This year a series of trials have been carried out to build up a total of 100,000 fruit fly individuals killed in artificially infested pears by cold storage at 33°F. for fourteen days, with no survivors. The United States Department of Agriculture requires this, to demonstrate that the treatment gives at least probit nine mortality.

No fruit fly was detected in the Murrumbidgee Irrigation Area and nearby towns of Narrandera and Hillston in the last twelve months. The fruit fly suppression scheme was operating, with regular fortnightly mist baitings with malathion and protein hydrolysate and, in each locality, a grid of non-retaining male lure traps and malathion impregnated pads.

At Hay, a very small and localised infestation was detected. Larvae were found in the fruit of an apricot and one Elberta peach tree in January, and again in one fruit from a peach seedling in February. A total of twelve adult fruit flies was trapped at Hay.

Eighty-five samples of boxthorn (*Lycium lorridum*) berries were received from Tamworth (45), Richmond (15), Wellington (7), Narrabri (6), Dubbo (4), Gilgandra (3), Coonabarabran (1), Tenterfield (1), Howlong (1), Caringbah (1), Broken Hill (1).

Queensland fruit fly was bred from Tamworth and Tenterfield material in December-January and from Richmond material in March. Previously, these had not been bred from boxthorn berries before February.

Other insects bred were *Carpophilus hemipterus* (Wellington material) and *Carpophilus* sp. (Tamworth), *Drosophila melanogaster* (Tamworth, Dubbo and Wellington), *Lamprolonchaea brouniana* (Tamworth, Dubbo, Wellington, Richmond, Broken Hill and Tenterfield), *Muscina stabulans* (Wellington and Dubbo), *Musca domestica* (Wellington and Dubbo), *Musca domestica* (Wellington and Tamworth), *Fannia canicularis* (Wellington and Dubbo), *Niditinea fuscipunctella* (Tamworth and Broken Hill), *Epiphyas postvittana* (Tamworth, Dubbo and Coonabarabran) and *Pyralis farinalis* (Tamworth).

STORED PRODUCTS PESTS

Wheat Pests.—Examination of wheat export shipments which commenced in March, 1964, was continued. Of the 129 samples examined to the end of 1964, live insects were found in 59 and nil insects in one at the first sieving. Since January, 1965, 71 samples have been examined; live insects have been found in 7 and nil insects in 19.

This very considerable improvement is attributed to the application of 12 p.p.m. malathion spray to the grain, on intake at all country storages of the Grain Elevators Board, during the 1964-65 harvest. The improvement does not appear to have been reflected in the acceptability of the wheat on arrival at the mainland Chinese ports. The same number of shipments has been rejected by the Chinese authorities this year as in the same period last year.

The main species of insects found in the samples (incubated for 8-10 weeks after the initial sieving) were rice weevil (*Sitophilus oryzae*), lesser grain borer (*Rhyzopertha dominica*), saw-toothed grain beetle (*Oryzaephilus surinamensis*) and flour beetles (*Tribolium* spp.). The lesser grain borer was, after incubation, the dominant survivor in samples of the 1964 shipments. Any emerged rice weevils and other insects were usually dead at time of examination.

The Australian Wheat Board sieve used by inspectors to detect infestation in export wheat was compared with finer sieves (0.064 mm. mesh) used in the laboratory. This indicated that inspection could be easier and more accurate with the latter.

Maize Pests.—The shelled maize experiment, set up in October, 1962, at Grafton, has been concluded. Malathion 10 p.p.m. was effective for 11 months, malathion 20 p.p.m. for 16 months, lindane 5 p.p.m. for 21 months and lindane 10 p.p.m. for about 25 months. Insects infesting the maize included *Sitophilus zeamais, S. oryzae, Tribolium* spp., *Carpophilus dimidiatus, Sitotroga cerealella, Cadra cautella* and psocids.

Husked maize cobs infested with maize weevil (*Sitophilus zeamais*), rice weevil (*S. oryzae*), and Angoumois grain moth (*Sitotroga cerealella*), and with a moisture content of 12 to 16 per cent, were treated at Grafton in August. The materials were malathion dust 10 and 20 p.p.m., malathion spray 10 and 20 p.p.m., and synergised pyrethrum dust and spray 2.5 p.p.m. After 9 months, malathion dust 20 p.p.m. was giving complete protection. The other treatments were obviously exerting control, compared with untreated material. A comparable result was obtained in another experiment, at Kempsey, similar except that the moisture content was 23-25 per cent, at treatment.

Storage trials with unhusked and husked maize cobs, whole grain and hammermilled grain demonstrated that hammermilling will kill *S. zeamais, S. oryzae* and *S. cerealella* infestations in the grain. This provides a practical method of preventing loss of feed grain in storage, if re-infestation is prevented. Husked cobs showed less insect infestation than other forms in storage, nine months after the trial started.

The effect of a patented method of storing grain in an atmosphere of alcohol vapour was tested in the laboratory. Maize as grain and unhusked cobs infested with *S. zeamais, S. oryzae, Sitrotroga cerealella, Tribolium* spp. and *Plodia interpunctella*, and wheat infested with *S. oryzae, Rhyzopertha dominica, Oryzaephilus surinamensis, S. cerealella, T. confusam, Cryptolestes* sp., *P. interpunctella* and *Carpophilus dimidiatus*, were stored in 5-gallon drums. The drums were sealed with polyethylene film, and 10 ml. methylated spirits per drum had been added.

Examinations made one and two days and three months after the start showed that the alcohol vapour did not control the infestations. Live insects survived in the wheat and maize *cobs* after three months, but not in the maize *grain* drums. In the latter the high respiration rate of the grain in full drums apparently produced effective airtight storage. Weevil infestation died within one month of sealing full drums of untreated maize grain.

Flour Pests.—Effectiveness of the anti-metabolite, imidazole, in flour was investigated in a laboratory trial. Fifty adults each, of *Rhyzopertha dominica, Tribolium casteneum, Sitophilus oryzae, Oryzaephilus surinamensis,* and *Lasioderma serricorne* were placed in duplicate jars of 1 per cent imidazole in flour, 10 per cent imidazole in flour, and untreated flour

There was complete mortality of *L. serricorne* in the untreated flour one month later. All other species survived.

In the 1 per cent imadazole treatment, there was 100 per cent mortality of *R. dominica, S. oryzae* and *O. surinamensis,* but only 20 per cent of *T. casteneum.* In the 10 per cent imidazole treatment, there was 100 per cent mortality of all species. No breeding of *T. castaneum* had occurred in the 1 per cent imadazole treatment 7 weeks after the trial began, but larvae were numerous in the untreated flour. In another trial there was 84 per cent mortality of *T. confusum* in 10 per cent imidazole-treated flour after two weeks. Further investigation of more economic rates is planned.

Sealing of Stored Foods.—Resistance of polyethylene film of various thicknesses (1.5 mm, 4 mm and 6 mm) to penetration by a mixed population of *Sitophilus oryzae, Rhyzopertha dominica, Tribolium castaneoum, Oryzaesphilus surinamensis* and *Lasioderma serricorne* was tested. This was by placing in drums containing the insects and a small amount of food material sealed bags made of the various thicknesses of polyethylene and containing sterilized wheat. Bags of 6 mm film with two small ventilation holes near the bottom, containing polyethylene pellets, and similar bags containing wheat, were also tested.

After two weeks the 1.5 mm film had been penetrated in three of the four replicates, but there was no penetration of 4 mm and 6 mm bags despite evidence of considerable gnawing on the surface. After six weeks, numerous holes had been made in the 1.5 mm film, one hole in the 6 mm film, but there was none in the 4 mm film bags. Some insects entered one of the ventilated bags containing wheat, through the ventilation holes, within two weeks; and, after six weeks, both *S. oryzae* and *O. surinamensis* were present inside these bags and those containing polyethylene pellets. The only species found inside bags entered by gnawed holes was *O. surinamensis,* although *R. dominica* was observed gnawing at the polyethylene.

The resistance of aluminium foil-plastic-paper laminated sachets containing rice flour-space mixture, to penetration by adults of *R. dominica* and *S. oryzae* and adults and larvae of *L. serricorne* and *T. castaneum* was tested. After three months contact with these insects, living *T. castaneum* adults and larvae and dead *R. dominica* adults were found in the sachets. After only two weeks, the sachets had been penetrated on surfaces touching other sachets. *R. dominica* was observed gnawing through the paper layer.

Pests of Processed Rice.—In a laboratory test of the susceptibility of processed brown and white milled rice to insects commonly infesting rice, *Sitophilus oryzae, Oryzaephilus surinamensis* and *Tribolium confusum,* these insects were unable to breed in the processed rice to which salt had been added. But they bred readily in the unprocessed milled rice.

Mediterranean Flour Moth (Anagasta kuhniella).—Semolina infested with mediterranean flour moth, and sealed in small, polyethylene film packets and in calico bags, was fumigated with methyl bromide 3 lb per 1,700 cubic feet. Preliminary examination indicated that the larvae and pupae inside the polyethylene packages had been killed by the fumigation. Incubation of the samples confirmed that no immature stages of the insect had survived.

VEGETABLE PESTS

Potato Moth (Gnorimoschema operculella).—Hot, dry conditions in tableland areas favoured infestation by potato moth. Control with DDT was often unsatisfactory. The abnormally high temperatures did not favour DDT.

In a spraying trial at Orange, azinphos ethyl at 6 oz a.i. per acre was the only effective treatment. It gave excellent kill of larvae in foliage and stems, and prevented re-infestation for 2½ weeks despite conditions very much in favour of the pest. DDT 1.5 lb a.i. per acre and DDT 1.5 lb plus dimethoate 4.2 oz a.i. per acre did not kill all larvae present at the time of spraying and a limited amount of re-infestation occurred shortly after treatment. Heatwave conditions prevailed at the time of treatment and for about 14 days subsequently. This may well have affected the performance of the DDT. No advantage was gained by adding dimethoate to DDT. Dimethoate alone at 4.2 oz a.i. and bidrin at 4 oz a.i. per acre were relatively ineffective.

Potato Aphids (Macrosiphum euphorbiae; Myzus persicae).—Incidence of the two aphid vectors of potato virus leaf-roll, potato aphid (*Macrosiphum euphorbiae*) and green peach aphid (*Myzus persicae*) was again studied at several sites in the Orange-Millthorpe district.

The very dry season and the activities of natural enemies were against development of high populations of aphids. But there was a great increase on potatoes in January and February, after the potato moth control sprays were applied. No large migrations of winged aphids into potato crops occurred this year. In the previous year populations were much greater.

In early spring, before potato crops were available, both species occurred in big numbers in relatively sheltered situations on weeds and peas. They were generally not found on weeds close to where potatoes were to be planted. The active stages of both species seemingly overwintered on weed hosts in sheltered situations. Green peach aphid in the egg stage overwinters also on peach and nectarine trees, but correlation between proximity of these hosts and populations of aphids in potatoes or weeds was not established.

Few aphids occurred on tubers that were being green-sprouted in closed sheds. It seems unlikely that virus transference is important where sprouting is being done in such situations or in very sheltered situations outdoors. But virus transference may be a problem where tubers are being sprouted outdoor exposed to wind currents.

Volunteer potato plants could be a source of virus infection. These plants, emerging in October, were immediately colonised by winged aphids of both species. Commercial plantings, emerging from November onwards, became infested soon after coming above ground and aphids were never entirely absent during the growing season. There was an indication that early-planted crops experienced lighter infestation than later-planted crops during their first few weeks of growth. These weeks are critical for virus transference. But there appears not to be any great advantage in early planting.

At Orange, disulfoton granules at 1 lb a.i. per acre, mixed with superphosphate, placed near and alternatively beneath seed potatoes at planting, kept plants free from aphids for five to six weeks respectively. Emergence and build-up of aphids was slow even after that in the latter case.

Spraying an elite seed area at intervals ranging from 10 to 21 days with demeton-S-methyl at 4 oz a.i. per acre was effective, although commercially excessive. It kept the crop free from aphids. There was evidence that 14 days would be the maximum period of protection to expect when migration is at a high level; while an interval of 10 days would be preferable when plant growth is rapid in the first two or three weeks after emergence.

In another trial, hand sprayed demeton-S-methyl (4 oz a.i. per acre) at 200 gallons per acre seemed superior to boom spraying at 40 gallons per acre (4 oz demeton-S-methyl a.i. per acre) when plots were sprayed only when required. But there may not have been a significant difference. Two, or three, applications at intervals of 14 days gave the crop complete protection. But the success of this light programme of spraying was due to lack of migratory activity after mid-February, and the effectiveness of natural enemies.

Vamidothion, 6 oz a.i. per acre, applied by boom spray in mid-January, mid-February and at the end of March to a crop grown commercially for certified seed controlled aphids. Re-infestation at the end of April, of occasional plants not killed by mid-April frost, indicated the need for artificial destruction of the tops by mid-April. In another crop, which came up in early January, it was necessary to spray on 16th January, 3rd February, and 2nd March to keep the crop free from aphids. A fourth application was made on 31st March as a precaution.

The longer intervals this year between spray applications were possible because the season did not favour development of migrant aphids. Systemic insecticides applied by low volume boom sprays have been effective in killing aphids on potato plants. But more than fourteen days protection cannot be expected when alate migrants re-infest.

Mushroom Pests.—A "black light" trap with an electrically charged grid, was installed for a week in late September in a mushroom house of 6,000 cubic feet capacity at Kellyville. It failed to reduce substantially populations of sciarid and phorid flies. The unit destroyed thousands of flies, but the density of insects appeared unaltered until the house was sprayed with dichlorvos e.c. 100 per cent at the rate of 1½ fl. oz in 5 gallons of water.

ANIMAL PESTS

Sheep Blowfly (Lucilia cuprina).—Due to dry weather, fly-strike was negligible in the three field experiments. In these, two experimental organophosphorous compounds, one carbamate, and diazinon were applied to some 3,700 sheep.

Investigation of the formal genetics of *L. cuprina,* to assist future insecticide resistance studies, was carried a step further. It was established that white-eye and black pupa genes are not linked with the dieldrin resistance gene. Appropriate crosses to introduce either of the visible mutant genes and the dieldrin resistance gene into test cross progeny gave independent assortment into the four possible genotypes in each instance. Another recessive mutant, orange-eye, has held through four back-crosses and is thus also due to a single gene.

Stable Fly (Stomoxys calcitrans).—Due to the prolonged dry weather, stable flies were rare in the County of Cumberland. This tends to confirm the view that conditions for lush growth of grass and herbage favour the development of high field populations of stable flies.

DOMESTIC PESTS

Argentine Ants (Iridomyrmex humilis).—Five new areas of infestation—total area about 90 acres—were reported. Since April, 1950, 265 areas of infestation, covering over 6,000 acres, have been reported in the Sydney and Wollongong areas. Probably there are many more. Publicity this year has been slight. This may account for the low number of infestations reported.

The dry weather, and lower turnover of staff, only two replacements in twelve months, enabled better progress of spraying. A total of 830 acres has been sprayed, with 76,643 gallons of 0.75 per cent dieldrin and 725 gallons of 2 per cent chlordane. This includes nineteen areas of infestation (772 acres) completely sprayed, five areas part-sprayed and two areas where control spraying was done. Seventeen areas, four of them part-sprayed, remain to be sprayed. These should be completed within four-five months. The two areas of infestation reported in the City of Greater Wollongong, at Stanwell Park and Coniston, were sprayed in May-June. Help by the Police Rescue Squad was enlisted to spray the cliffs at Stanwell Park.

Clearing of vegetation from areas of infestation is still a problem because of delays by some Councils. This has necessitated spraying some areas out of their correct order.

Houseflies (Musca domestica).—Inspections over several months were commencing in the late winter of 1964. These established that false stable flies (*Muscina stabulans*) and lesser houseflies (*Fannia canicularis*), and not houseflies, were the predominants in an intensive poultry house at Kellyville.

The false stable flies were controlled by careful positioning of 1 per cent dichlorvos fly bait in spots they frequented. Baiting was ineffective against the lesser houseflies. These were controlled by misting with 15 c.c. of 100 per cent dichlorvos in 1 gallon of water in a shed 75,000 cubic feet in capacity. A similar amount of dichlorvos was misted outside the shed. Within five minutes of treatment, 90 per cent knock-down of flies was estimated.

Cockroaches (Blattella germanica *and* Periplaneta americana).—The sorptive dust dri die 67, which contains silica aerogel 15.3 per cent and ammonium fluosilicate 4.7 per cent and is relatively non-toxic to animals, was blown into ceiling and wall cavities, window and door frames and various other cockroach haunts in the animal house of a medical research centre in February, to control German cockroach (*B. germanica*) and American cockroach (*P. americana*). There was an immediate flushing of cockroaches from their hiding places and since then a steady decline in cockroach numbers.

The distinction between cockroach and silverfish damage to book-bindings has been determined in a laboratory test.

Mistletoe Brown-Tail Moth (Euproctis edwardsi).—Following teacher and pupil reports of great discomfort and skin irritation at a Kingswood school, a mixture of carbaryl in white oil was applied by a portable mist blower to the main building and out-buildings and to the bases of eucalypt tree trunks where mistletoe brown-tail moth caterpillars were sheltering. The same mixture was applied by a larger mist blower, operated from the back of a truck to the crowns of trees showing evidence of mistletoe growth. The while oil was diluted one in twenty-five with water, and the carbaryl added to make 0.1 per cent solution. A total of 14 gallons was applied by the portable mist blower, and 8 to 9 gallons by the larger one.

Results were excellent. Good kills of larvae were observed in many places. A report, five days after treatment, indicated dramatic reduction in occurrence of skin rashes.

Useful recommendations are now available for preventing infestations developing: lopping of mistletoe, particularly in public places such as schools, parks and churchyards; and for treatment of existing infestations and the laying of urticating hairs: the carbaryl and white oil mixture.

Funnel-web Spiders.—An unusually large number of funnel-web spider nests were seen under a house at Wamberal in June, 1964. Forty gallons of 0.5 per cent dieldrin were heavily applied over the soil around the footings and lightly applied between, under the house. Seven months later there was no evidence of spider survival or activity.

SYSTEMATIC STUDIES

Distribution and Taxonomy of Aphids.—The aphid trapping programmes of last year were continued. Many thousands of specimens have been examined and identified in the current period. The study of cereal yellow dwarf virus and its aphid vectors initiated last year has stopped temporarily. This is because of the prevailing drought conditions.

Distribution and Description of Scarabaeid Larvae.—Another 54 species of scarabaeid larvae have been identified and brief notes on the distribution and damage have been given where available.

Insect Collection.—This year 2,494 insects and 47 specimens of spirit material were incorporated into the collection and 2,264 of these were mounted; 4,519 more specimens, affected by verdigris or poorly mounted originally, were remounted.

Specimens of adult *Ceratitus capitata, Dacus cucurbitae* and *D. dorsalis,* and alcohol specimens of the pupae of *D. cucurbitae,* ovae and larvae of *D. dorsalis* and samples of *Gynaikothrips ficorum* (Cuban Laurel Thrips) were obtained from Honolulu and Hawaii. The Smithsonian Institute presented specimens of *Anthonomus grandis* and *Hypera postica.*

A list of parasites in relation to their hosts was compiled from the data of the Economic and Systematic collections. This included 56 Ichneumonidae, 52 Braconidae, 144 other Hymenoptera and 48 Diptera.

Study of the Curculionidae.—Specimens added to the weevil collection totalled 549 specimens of newly-mounteds and those of the late E. H. Zeck's collection. These belong to the following sub-families:—Brachyderinae (98), Sitoninae (22), Otiorhynchinae (9), Eremninae (55), Leptopinae (37), Cylindrorrhinae (2), Rhytirrhininae (13), Amycterinae (74), Gonipterinae (26), Rhadinosominae (2), Hyperinae (3), Cleoninae (6), Hylobiinae (2), Erirrhininae (33), Aterpinae (20), Amalactinae (5), Belinae (10), Apioninae (10), Attelabinae (1), Laemosaccinae (4), Haplonychinae (3), Cioninae (2), Cryptorrhynchinae (45), Rhynchophorinae (12), Cossoninae (3), Barinae (14), unclassified (38).

The Brachyderinae check list was completed with information from the British Museum (Natural History), the Naturhistoriska Rikemuseet at Stockholm, the Brussels and Paris Museums and the Hope Museum at Oxford.

A world survey of Fuller's rose weevil was completed with data obtained from the British Museum (Natural History), the Naturhistoriska Rikemuseet at Stockholm, Paris Museum, Cape Town, and the United States National Museum, Washington.

Chemistry Branch

CEREAL SECTION

New South Wales wheat production for 1964-65 achieved a record of almost 152 million bushels, about 20 per cent more than the 1963-64 record. The sown area, 5,760,000 acres was also a record, as was the yield average of 26.3 bushels per acre.

Of this production, 144.1 million bushels was delivered to either the New South Wales or the Victorian railway systems; 137.4 million to New South Wales, and 6.7 million into Victoria or to border stations for movement through the Victorian system.

The dramatic swing to bulk handling in New South Wales in the last decade was graphically illustrated. Even with some long delays in delivery, due to the strained bulk storage system, only 8 million bushels (6.2 per cent) was delivered in bags.

F.A.Q. and Silo Survey.—As usual, early samples and final samples from each silo in the State were received and tested for the Grain Elevators Board, to enable equitable distribution of wheat to local mills and to help fill special export orders.

The official F.A.Q. samples were tested for the Australian Wheat Board. The results were subsequently confirmed on the export wheats from Newcastle and Sydney. Due to the high yields, and competition for available nitrogen, the grain proteins are at low levels. The south-western F.A.Q. is at 9.6 per cent and the northern at 10.6 per cent; respectively 0.8 per cent and 1.3 per cent less than in the previous year.

There is an associated lowering of protein levels in the flour. The south-western flour sample is below 9.0 per cent and needs protein supplementation to make attractive bread. The local flour millers have found addition of premium wheat to their flour grists necessary, to make baker's flours.

With poor prospects for a northern harvest in the coming season, millers are eking out their protein supplies. This has caused a lowering of flour protein levels during the period April to June, 1965, and prospects are not likely to improve in the near future.

The wheat this year has been of good bushel weight, of bright appearance and particularly low in moisture content. The latter would be most attractive to wheat purchasers and is still a significant factor in the sale of Australian wheat.

Premium Wheats.—The Department was represented by the cereal chemist at a meeting convened by the Premium Wheat Growers Association to consider which wheat varieties were acceptable for receival into the bulk premium scheme operating in the north of the State. Others present were from the Grain Elevators Board, the Australian Wheat Board, the United Farmers and Woolgrowers Association, the University of Sydney and the Bread Research Institute.

Varieties acceptable at the 1964 harvest were as follows:—Gabo, Gala, Gamenya, Koda, Mengavi, Spica, White Hopps, Windebri, Eureka, Mendos and Multiline No. 1. Mendos, White Hopps and Multiline No. 1 were additions, compared with the list of acceptables at the 1963 harvest. The Departmental representatives supported inclusion of Mendos, based on quality data derived from Departmental testing; and did not oppose inclusion of Multiline No. 1 (a mixture of Mendos, Gamenya, Mengavi and Gala). Eureka was acceptable only for 1964 and was to be excluded in following years.

A bulked premium sample after harvest was fully tested in the Department's laboratory. The sample was experimentally-milled and baked, and its dough characters were physically measured. The type sample had good quality but not the inherent strength expected of prime wheats. These should have good carrying capacity, for mixing with weaker wheats. The sample, with somewhat extensible dough characteristics, would be more acceptable to the local market than to overseas purchasers. Consideration of inclusion of varieties possessing good inherent strength is needed.

New Variety Releases.—Due to scarcity of varieties with rust resistance, an emergency meeting of the Standing Advisory Committee was held in February, 1964. The meeting recommended the varieties Mendos and Festiguay for release in the 1964 sowing season. The 1964-65 season gave further opportunity to test these two varieties, from trials throughout the wheat belt.

Results from the previous season have been more than confirmed. The University-developed Mendos has reasonable strength and is in the Gabo-Mengavi class. The Department's crossbred (Festival X Uruguay) named Festiguay has excelled in bakehouse performance and warrants consideration for inclusion in the premium grade.

Other products of the northern and southern breeding programmes have been tested this year, from the 1964-65 harvest.

In an attempt to diversify rust resistance, a wide range of multilines were sown in the northern programme. These multilines are based on varying combinations of a number of rust resistant parents with similar agronomic characteristics. They are mixed prior to sowing. Laboratory testing is producing confusing results. They reflect domination by one parent which could also be dominant in the paddock.

Uniform Quality Testing.—A crossbred from the southern programme and two crossbreds from the University programme have been distributed to collaborating laboratories for testing. The collaborating laboratories are three city and one country flour mill, the Bread Research Institute, and the cereal laboratories of the Agricultural Research Institute, Wagga, and Agricultural Research Station, Tamworth. The Quality Subcommittee will meet in July, 1965, to consider the results.

Laboratory Output.—This year 1,098 samples of wheat were experimentally-milled: and 391 flour samples were received for testing—mainly for export flour certification but a few flour samples were tested as usual for institutions such as Prisons Department and Navy Department.

Volume of experimental baking was about the same as that of last year; 2,258 experimental loaves were baked, and scored for their quality characteristics.

Number of protein determinations fell by 700 to 4,284; reflecting the drop in samples analysed in connection with research grant projects, but also the loss of a laboratory assistant employed under the Wheat Industry Research Council Grant.

Other laboratory operations included 2,087 ash determinations, and 1,807 air-oven moisture determinations on wheat and flour samples.

Machineability of Doughs.—A new, variable speed belt-moulder was received, and studies were undertaken on various samples from plant breeders as well as the currently grown varieties. Although the results have not yet been fully assessed and the work needs to be done on samples from several growing seasons, the loaf quality of currently grown varieties as a result of machining does not appear to suffer much by comparison to the results of hand moulding.

Soft Wheat Quality Programme.—Work continued on the Soft Wheat Quality Programme. Irrigation production of biscuit wheats at Leeton and Yanco Agricultural Research Stations is being investigated. Some results will be reported to the 1965 Cereal Chemistry Conference.

The wheat quality survey of the central west is in progress. This has revealed widespread incidence of mottling in hard wheat varieties in the western portion of the central west. Results of this work are in press for the *Agricultural Gazette of N.S.W.*

Wheat Industry Research Council Grant.—Carrying capacity of a number of selected hard composites was assessed, using milling and baking tests. This is the ability of a strong wheat to improve the baking quality of a weaker wheat. Varying amounts of the hard composites were blended with south-western F.A.Q. The same treatment was applied to bulk premium wheat from northern New South Wales, allowing a comparison wherein the harder composites compared favourably with the premium. They all had an improving influence when blended with F.A.Q. in as low a proportion as twenty-five parts of hard composite to seventy-five of south-western F.A.Q.

Results of the 1963-64 survey, undertaken for this segregation study and for a soft wheat project, have confirmed the results achieved by the type of segregation used in the 1962-63 survey. This involved classification of each sample according to appearance and variety.

The final report has been drafted and publication will be completed in the ensuing year.

PESTICIDES SECTION

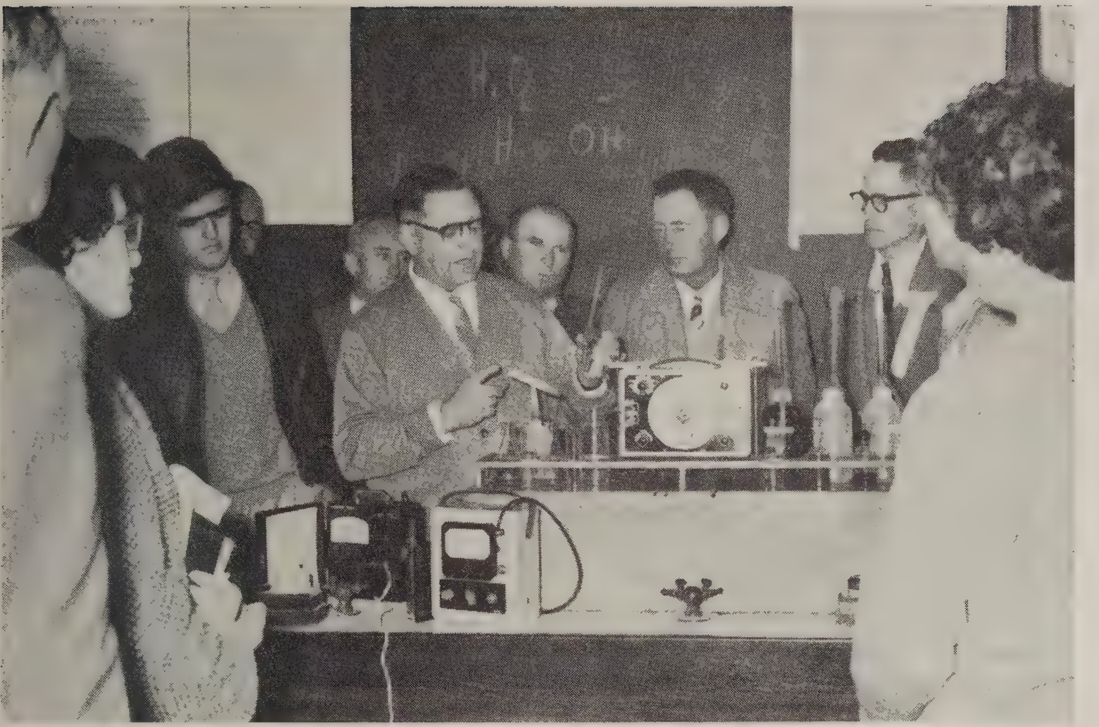
Chemical and Biological Investigation of Sheep Dips.—In conjunction with Glenfield Veterinary Research Station the investigation of sheep dips for the control of lice, ked and itch-mite continued as follows:

(i) Experiments on mixed sheep dips containing an organic phosphorus (O.P.) compound and lime sulphur were carried out, using more sheep than in the previous year. Combined effects of chemical decomposition of the O.P. compound by alkaline hydrolysis and its depletion by the physical process of "stripping" were examined under field conditions, using a mixture of an oil-in-water emulsion of the O.P. compound and lime sulphur solution.

(ii) Experiments were carried out with four distinctly separate breeds of sheep to measure the effects of differences in wax content, and other properties of the fleece, on rate of depletion of an O.P. oil-in-water emulsion formulation when the sheep were treated in a "shower" dip.

Phytotoxicity of White Spraying Oils.—White oils applied as citrus sprays for scale control were examined to ascertain the cause of leaf injury and defoliation. The oils were not contaminated and in general conformed to the required standards of quality (oil content, unsaponifiable residue, viscosity and volatility), and of stability in hard and soft water. Other components in the formulation (such as surface active agents used to emulsify the oil) may have caused or contributed to the damage. A later opportunity will be taken to examine this possibility.

Animals and Insecticide Residues from Pasture.—In an experiment at Leeton Agricultural Research Station, pasture was treated with 2 oz and 4 oz DDT per acre to control red legged earth-mites. Lambs were grazed and withheld from grazing for various length of time after application of the DDT. Pasture was sampled and animals were slaughtered and sampled during the experiment, to provide data on the effects of formulation, rate of application, withholding periods, and length of grazing time on residue levels. All results from animals were related to the 7 p.p.m. tolerance imposed by the Food and Drug Administration of the U.S.A.



Demonstration of Water Testing at Agricultural Bureau Convention

Water-testing equipment devised by Chemistry Branch is located at each of the nine Regional headquarters. Farmers in this drought year made a record number of calls (3,508) on the Department's decentralised water testing service.

Results have yet to be statistically assessed. The experiment has indicated that the tolerance was likely to be exceeded if animals were allowed to graze immediately on treated pasture. Hazards were very much reduced if several weeks elapsed before grazing. All except one of the treatments (4 oz emulsion DDT/acre) could be considered safe after four weeks. Emulsion formulations provided a greater hazard than dusts.

Misting of Vegetable Crops.—A further experiment to determine deposition, retention and distribution characteristics of misted DDT sprays on trellised tomatoes was conducted at Narara Horticultural Research Station. Comparison was made with a recommended high volume application. The DDT deposits on foliage, stems and fruit are to be correlated with biological efficiency against the Heliothis caterpillar pest. DDT residues on marketable fruit were well within the 7 p.p.m. tolerance; misted fruit had lower residues than fruit treated with the high volume spray. Results from the experiments have yet to be statistically assessed.

Insecticide for Plague Locust Control.—Samples from a consignment of 31 tons of Japanese lindane purchased by the Government for later formulation into insecticide for the control of the plague locust were examined. They were of high quality.

Pesticides Standards.—The Chemistry Branch continued to be represented in the New South Wales Pesticides Sub-committee of the Australian Standards Association. Australian Standard specifications for phenothiazine and hormone weed-killers have now been published.

INVESTIGATIONS INTO EXCESS SPRAY RESIDUES ON FRUIT

The work proceeded as follows:

1. *Mercury*.—(*a*) In apples from trees which had received an autumn eradicant spray but no spray during the growing season:—In the Batlow and Orange districts only two orchards in which the trees had received an autumn eradicant spray but no mercury spray during the 1963-64 growing season were located. Three samples of apples were obtained; their mercury contents were too low to be detected. (*b*) In samples of apples of the three main varieties (Jonathan, Delicious and Granny Smith) which had received uniform spray treatment: Two sets of samples were obtained, one from Bathurst Agricultural Research Station and the other from Batlow. The results showed no appreciable difference between the mercury contents average of apples of the three varieties stated above.

(*c*) In samples of apples (Granny Smith and Jonathan) for which the following mercury spray programme had been drawn up:—

(i) at spur burst;
(ii) at spur burst and early November;
(iii) at spur burst, early November and early December;
(iv) at spur burst, early November, early December and early January;
(v) control (no mercury sprays):—

Preparation of sets of such samples at Bathurst Agricultural Research Station and another set at Batlow was planned but due to a staff change the Batlow sprayings were not done and the first spraying at Bathurst was missed. Analysis of the other samples from Bathurst is proceeding. The required sets of samples will be secured from Batlow and Bathurst in the 1965-66 season.

2. *Azinphos-methyl and carbaryl*: *Rate of Breakdown of Residues on the Fruit after Harvest*.—The 1964 results were unsatisfactory, due to sampling errors in the field. The work was repeated during 1965, using an improved sampling method. This time, however, the fruit from two of the three orchards sampled, for azinphos and for carbaryl, had been too lightly sprayed to satisfy the experiment. The samples with low residues were therefore dipped in the spray solution (0.05 per cent in the case of azinphos-methyl and 0.1 per cent in the case of carbaryl). Analyses are proceeding.

WATERS SECTION

The State's serious drought conditions for the last eight months have led to very heavy demand on the water testing services of the Department, particularly the partially decentralized services in the nine Regions and in two irrigation areas.

Central, Water Testing.—Partly in consequence of the readily available service in the Regions, the demand for service from the central laboratory at Rydalmere was about normal at 780 samples. These included problem waters submitted to the main laboratory when the decentralized service was unable to satisfy the needs of the case.

Decentralized, Water Testing.—The electronic and chemical equipment for the decentralized service was set up in 1959 and is currently operated by Departmental extension officers; agronomists, fruit officers, dairy officers, and others.

The total of samples tested by these officers was 3,508; twice the record of 1,728 samples tested in the previous year. Of the total, 326 samples were tested and reported on for the N.S.W. Water Conservation and Irrigation Commission—through the Department's services at Wagga and Orange.

The Regional on-the-spot water testing service is highly valued by primary producers. A striking segment of this service has been provided in the annual report from the Mid Coast and Hunter Region, covering the most severely drought-affected dairying area. In this Region in the five years 1959-1964, water samples for analysis averaged 10 per month; in the five months December 1964 to May 1965, samples averaged 118 per month. In March 1965, 287 samples were tested, due in part to the ingress of sea water into the Paterson river but mainly because stock water supply had become critical over a wide area and bores were being sunk at all possible sites. Very few new sources of underground water suitable for irrigation emerged from the many bores and spear points sunk.

The Mid Coast and Hunter Regional Supervisor reported that the water testing service not only played an important role in helping farmers to meet the drought conditions. It also provided a valuable overall picture of the water resources position in the Hunter Valley.

The decentralized, water testing service has also brought into contact with the Department many farmers who might not normally have made an approach. It is expected that in the future there will be improved response from these farmers to other services provided by the Department. This note has been struck in reports from Supervisors in several Regions. Seemingly the value of the service in linking the pastoral and farming community with the Department has been high.

Research.—Work that was commenced in 1963-64 in the Tullakool area, on salinity aspects of the reclamation of affected land and its restoration to pasture, was further pursued.

REGULATORY AND GENERAL CHEMISTRY

STOCK FEEDS AND MEDICINES

Quality of registered stock feeds marketed in the State was surveyed in the Newcastle and Cumberland districts. The data from analyses of the samples mostly conformed with standards as registered. Where divergence was detected appropriate action was taken.

Several stock medicines suspected of non-conformity to registered formulation were also analysed. Reports were furnished.

Results of protracted studies of the stability of Vitamin A in commercial stock feeds were published this year in the June *Agricultural Gazette of N.S.W.*

Departmental action has been initiated, to review and amend the Stock Foods and Medicines Act and Regulations in keeping with technological advances. The Chief Chemist and another officer of the Branch are members of the Committee.

DAIRY PRODUCTS CHEMISTRY

Cheese.—A quality survey affecting cheese manufacture was undertaken. It involved analysis of 141 samples of various types of cheese. This was to assist the Division of Dairying.

Butter.—A project was undertaken to assess the effect of variables in butter manufacture methods, on keeping quality. Forty-seven samples taken during storage over a period of 6 months were analysed. Data from the analyses included figures for salt, moisture and water dispersion. Bacterial studies were made by the Division's Biology Branch.

Two retail sales, butter quality surveys were also undertaken. These involved analyses of 100 samples from Sydney metropolitan and 100 samples from country sales outlets. Moisture and salt determinations, and bacterial counts, were made.

Margarine.—Twelve samples of margarine from Sydney retail sources were examined for salt and moisture content.

PHYSICO—CHEMICAL AND ISOTOPES SECTION

Method for Determination of Total Potassium in Soils.—A paper under notice this year described determination of total potassium in fertilizers by counting the gamma radiation emitted by the naturally occurring radioactive isotope K-40. If this method were suitable for soils, it would be attractive for a number of reasons. Suitable equipment to test the method was available at the Prince Henry Hospital. The results did not agree with chemical figures. With help from the Australian Atomic Energy Commission Research Establishment at Lucas Heights the discrepancy has been established as due to interference by naturally occurring radioactive elements of the uranium and thorium series, and that the method as originally described is not suitable for soils.

It is possible to correct for the interference and obtain reliable results if more complex equipment is used. Cost of the equipment is prohibitive at present, but this might change in a few years. A note has been submitted for publication, to assist other soil potash workers.

Soil Penetration by Phosphate Solutions.—During 1962-63, in conjunction with the soil potash programme, the penetration of phosphate solutions through soils and availability to crops was subject of pot experiments. This year a decision to publish the results was reached, but it was decided also that certain additional information should be presented to permit the publication to make full impact. The necessary work was done and a note has been submitted for publication.

The interest in soil penetration by phosphorus was to find a means of adding phosphorus to the active root zones of test plants during growth, to prevent the soil fixation which leads to phosphorus supply becoming a limiting factor on plant growth.

Studying Movements of Black Soil Scarab Beetles.—In response to a request from Entomology Branch, the possibility of using radioactive labels to study movements of black soil scarab beetles was weighed. Superficially this seemed a simple matter of attaching radioactive material to the beetles and later locating them in the ground by surface scanning with a geiger counter. From quantitative estimates of various aspects of procedure it is now doubted that statistically sound information would accrue with the resources likely to be available.

Free Energy of Soil Cations.—Current thinking gives prominence to free energy as a measure of the availability of cations to plants. Free energy is a thermodynamic function, rather complex in concept. It is not measured directly but calculated from measurements on soil: solutions systems in equilibrium. The physical chemist's specialised co-operation has been sought in projects covering this aspect of soil chemistry.

Currently, literature is being surveyed to assess the methods for measuring free energy and how to interpret the results.

Analyses by Atomic Absorption Spectroscopy.—The new, atomic absorption spectroscopy method of analysis has been most successful. Nearly 2,000 samples were analysed by the Plant Nutrition Section for calcium, magnesium, sodium, potassium, zinc, manganese and copper.

The new instrument has also been valuable in analysing rock phosphates and wood ashes for those seven elements. The information gained was used to produce synthetic standards for analysis of rock phosphates and wood ashes semi-quantitatively on the large spectrograph.

A new burner mount with horizontal and vertical adjustments has now been introduced on the atomic absorption spectrophotometer. It has yielded a much more accurate and rapid positioning of the burner in the light path.

The Large Spectrograph.—Use of pre-formed electrodes and a micro-mixer mill for sample mixing has greatly improved the analytical procedure. The mill obtains a uniform sample with remarkable ease. Three samples can be mixed simultaneously; a major time-saver. Importantly, too, with the mill each sample can be given an identical mixing time. Using the pre-formed electrodes has speeded the procedure compared with when the electrodes were produced in the laboratory.

Fertilizers and Fertilizer Base Materials Analyses.—Jointly with the Plant Nutrition Section a project aimed at analysis of fertilizers and fertilizer base materials for major and minor elements has been started. Initially the work is on rock phosphate from various origins; supplied by Australian Fertilizers Ltd. There will be associated glasshouse trials to study effects produced by fertilizers with different trace element contaminations.

Wood Ash Fertilizer Qualities.—It has been apparent that in many instances wood ash is a fertilizer superior to many of those more commonly used. Ashes from known species of trees are being analysed for their major and minor element contents, to clarify this. Also, glasshouse experiments will be done to study the effects of various wood ashes on different soil types, compared with commercial fertilizers.

In the already completed pilot experiment some important results were recorded. This experiment is being repeated in light of analytical results which were not previously available.

Fifth Australian Spectroscopy Conference.—The Chemistry Branch was represented at the Fifth Australian Spectroscopy Conference, in Perth from 31st May to 2nd June, 1965. Arising from this conference were several new developments in atomic absorption spectroscopy, with definite application to the work at Rydalmere. These will be implemented as funds permit.

PLANT NUTRITION SECTION

Preparations for a Citrus Leaf Analysis Service.—In co-operation with Biology Branch and Division of Horticulture, 30 orchards were selected from each of the four main citrus growing areas: County of Cumberland, Gosford, Murrumbidgee Irrigation Areas and Dareton. The purpose is to establish a citrus leaf analysis service.

The orchards selected were comparatively free of disease, insect damage and soil problems. Samples were collected during summer and have now been analysed. During the collecting, detailed notes were taken on each orchard; as to cropping, fertilizer history, age of trees, management practices and incidence of symptoms relating to nitrogen, phosphorus, potash, magnesium, manganese, etc.

A panel of members of the two Divisions has made fertilizer recommendations for the coming season to each of the growers, based on analyses of the samples. Leaves from the same orchards will be analysed over a period of about four years; trends will be studied, further to the recommendations.

Feed Value of Tree Foliage Under Drought Conditions.—Numerous enquiries about feed value of materials to supplement rations were received, from all parts of the State. These led to literature surveys, and analyses of a wide range of leaves of trees. Leaves from about 40 trees were analysed for protein. The protein content varied from about 5 per cent (Turkey Bush) to about 16 per cent (Wild Peach). Field officers reported that leaves of many of the trees were relished by stock.

Apple Leaf Analyses.—Monthly sampling and analyses of apple leaves from Oakdale, Thirlmere and Wedderburn continued. Trees from many orchards were under stress. In contrast to Orange and Batlow, potash levels in the apple areas near Sydney had always been low. Many of the growers here had been applying potash for up to three years.

Analyses showed potash to be reasonably high in these orchards, for the first time since monthly samplings were undertaken. Copper and zinc levels were consistently low in these same apple areas, except where a zinc sulphate spray or fungicidal zinc spray had been used. Implications of these results have yet to be studied in detail.

Post-Graduate Training.—Two new appointees to Chemistry Branch have been allocated to the Plant Nutrition Section for further training before they take up a position respectively at Wollongbar and Yanco. The appointee for Wollongbar is being trained with particular relationship to pasture analyses. The appointee for Yanco is specialised in fruit tree nutrition; his work at Yanco will be concentrated on development of leaf analyses.

Nutrition and Toxaemic Jaundice.—Investigations into toxaemic jaundice were initiated in 1960, when trials on lucerne and subclover were laid down on two south-western sites. Yield data and samples for chemical analysis have been taken continuously. This year alone, 200 samples have been analysed for Molybdenum (Mo) and Copper (Cu). Some interesting results or trends have arisen:—(i) The Cu:Mo ratio on lucerne and on subclover can be substantially changed by the addition of Mo; in lucerne's case the Cu:Mo ratio can be reduced from 42 to 0.76 by Mo applications; likewise Cu and Mo ratio in subclover can be reduced from 134 to 0.23. (ii) Lime application significantly increased Mo content in subclover and lucerne. (iii) Gypsum depressed Mo in both species.

This year the field trials have deteriorated, and termination is under consideration.

Chloride Analyses.—Because of the dry season, chloride analyses of samples from all parts of New South Wales have been needed. Chloride toxicity has been serious in this drought year.

Evidence has accumulated that chloride toxicity may be accentuated on horticultural blocks and in other crops by the use of potassium chloride. This has been of particular concern in the Gosford, M.I.A. and Lower Murray citrus growing districts.

Minor Elements in Fertilizers.—In co-operation with the Physical Chemistry Section a survey of minor elements in rock phosphate and superphosphate has been undertaken. There is, for example, evidence that zinc content varies markedly with source of calcium phosphate. This survey will attempt to establish the minor element content of all sources of rock phosphate.

Fertilizer companies will submit a representative sample of each batch of calcium phosphate as received from the ship. The main sources were Ocean Island and Nauru but rock phosphate now comes from additional sources including Christmas Island, Florida and North Africa.

Mineral Content of Wood Ash.—In co-operation with the Forestry Commission and the Physical Chemistry Section a wide range of wood ashes has been analysed for mineral content. Responses to wood ashes have been constantly observed in the field. Theories as to the cause of responses have included speculation on soil sterilization, release of nutrients by heat, addition of nutrients through burnt ashes, destruction of harmful micro-organisms, etc.

Present data indicate a large variation in the mineral content of wood ashes. As work proceeds it may show that response to burnt ashes in the field is not a simple matter conditioned by one factor but the outcome of a number of factors.

Pasture Analysis at Hawkesbury Agricultural College.—Pasture samples have been analysed in co-operation with Hawkesbury Agricultural College. The results are assisting the interpretation of grazing responses to various grass and legume species.

Cotton.—Growers have been pressing the need of petiole analyses. After three years experience, a number of problems have become evident.

It is clear that appropriate nitrogenous fertilizers may increase yields by up to a bale per acre, but on the other hand if too much nitrogen is used the cotton matures too late and severe frost damage is incurred.

There is a grower tendency to use the land without rotation. When this occurs, nitrogen deficiency is acute in the second and third years.

Total nitrogen and nitrate nitrogen determinations have been carried out on Narrabri "rates of nitrogen" trials. The number of trials will be increased in the next year, with a view to establishing useful relationship data as between cotton yield and nitrate nitrogen content of leaf.

Meantime, petiole analyses have been done for a number of growers. Standards taken from overseas literature have been used. The local standards for nitrate nitrogen and other nutrients will be developed within the next two or three years.

Analyses Output of the Plant Nutrition Section.—The increase of analyses total in the Plant Nutrition Section is indicated by the following statistics: 10,250 in 1958-59; 14,315 in 1959-60; 12,438 in 1960-61; 14,656 in 1961-62; 19,262 in 1962-63; 16,503 in 1963-64; and 21,714 in 1964-65.

Co-operation of the Divisions of Animal Industry, Plant Industry and Horticulture in projects has, among other factors, helped the increase to occur. The amount of work done by the Section is not fully reflected in the statistics, as the types of analyses have steadily changed. For example, whereas some analyses occupy very little time, forty man hour may be occupied by thirty sulphur analyses. In recent years the proportion of such time-consuming analyses has increased, as well as the analyses total.

SOILS SECTION

Soil Phosphorus Studies in Pasture Soils

Uniform Pasture Series Extension Trials (U.P.S.E.T.).—Soil samples from the "rates of superphosphate" and "rates of sulphur and phosphorus" trials have continued to be tested for "easily soluble" forms of soil phosphorus. Soils data are now available from over 200 pasture trials for correlation of soil phosphorus test values with yield data.

Rate of Rundown of Residual Phosphorus on a Northern Tableland Soil.—In a trial near Walcha, last topdressed with varying rates of superphosphate in 1961, after having received superphosphate rates ranging from nil to 32 cwt per acre over a period of eight years, soil phosphorus test levels unexpectedly showed an increase over those from the previous year's sampling. This year's abnormally dry conditions might have retarded significantly the phosphorus fixation processes in this soil. Until this year, Bray No. 1 solution phosphorus amounts decreased in value by one half per year.

North Coast Pasture Superphosphate Trials: *Grafton.*—Plant and soil analyses have been done on samples taken from seven of the original nine trials, sown last year to Ladino white and the summer legume *Lotononis bainseii.*

These trials were commenced in 1963, to study the responses of summer legumes and white clover to varying initial and maintenance rates of superphosphate. A marked plant response to phosphate is evident at all sites. The chemical analyses of plant material and soils from the control plots indicate that soil phosphorus is extremely deficient in the soils of this area.

Seven new trials have now been sown with Ladino white clover, and further trials will be sown with *Lotononis bainseii* in the 1965 summer.

WHEAT NUTRITION RESEARCH IN CENTRAL WEST

Wheat phosphorus test values of soils from last year's ten wheat fertilizer trial sites in the Condobolin-Parkes-West Wyalong area all indicated a low soil phosphate status for wheat growing. Significant yield responses to the varying rates of superphosphate (0-3 cwt per acre) and sulphate of ammonia (0-3 cwt per acre) were obtained from all these trials harvested last summer. Grain protein and phosphorus determinations were done on 500 grain samples.

An increased number of trials have been planned for this year. These will be over a much wider area of the wheat belt in the Central West.

SOIL POTASH WORK

Millet Studies.—Pot testing of coastal soils in the glasshouse is proceeding satisfactorily. Very interesting data have been obtained thus far. The initial phase of this work should be completed by the end of 1965. Analyses of plant samples accumulated throughout this study will commence soon. Preparation of the results for publication will occur over the next two years.

This year, studies on the penetration of phosphate added to the surface of pots were completed. This work, using the radio-isotope P_{32}, has been collaborative with the Physical Chemistry Section. A paper presenting the results has been submitted for publication.

Also this year, a method of determining total potassium in soils—using the radiation emitted by the naturally occurring radio-isotope K_{40}—was investigated. Results of this have also been submitted for publication.

A new type of soil sampler was developed and tested in conjunction with a private firm. This sampler has proved very suitable for sampling large areas where many cores are needed for representative sub-sampling.

Field Trials.—Phosphate and potash field trials have been laid out in the Berry, Robertson and Fitzroy Falls areas in conjunction with the Division of Plant Industry. Each trial was thoroughly sampled—80 samples of 0-6 in. depth and 80 of 0-3 in. depth. Each sample comprised 27 cores. Fertilizer will be applied in the spring.

Sampling of sites for the potash survey of shale soils was completed. A large number of these samples have been analysed. The results of this survey could be very useful in relating results of trials, at any one site, to other areas on the same parent rock.

Emphasis on potassium as possibly limiting plant growth has continued to grow. More areas which are highly pasture-improved are reporting possible deficiencies. The increased work has strained resources severely. Even so, expansion of the field work is inevitable, to obtain more information.

SOIL SURVEYING

Gwydir Survey, near Moree.—Following on jointly undertaken work by this Department and the Water Conservation and Irrigation Commission, mentioned in last year's Report, a Land Use map was produced by the Commission—also a report covering the general distribution of the soils and their division into land-use classes.

Clarence Valley Surveys.—Field work has been completed in the Mid Clarence Valley Reconnaissance Survey. The soil-landscape map and report have been drafted. The report is to be so constructed that it will be readily understood by farmers. This will delay publication.

Analytical maps for field work in the Upper Clarence Valley have been constructed, and preliminary field studies have started. The soil descriptions, topographic units, etc., recorded in the Upper Clarence Valley will be used to evolve a more flexible classification for the whole of the Clarence Valley.

The Department of Main Roads and the Forestry Commission have been very helpful in making available maps and other data. Funds assistance by the Australian Cattle and Beef Research Foundation, for field work and equipment purchase is gratefully acknowledged. A survey of these dimensions (5,000 sq. miles) could not have been undertaken by the Department at this time without such assistance.

Agricultural Research Station, Orange.—A detailed reconnaissance survey over this new Station was undertaken in April, 1965. The initial aim is to classify the soil into groups of varied land-use potential. Later in 1965, a Stage III survey will commence, to further delineate the soil boundaries and to characterise the soil chemically.

Proposed Aerial Photographic Interpretation Course.—On a resolution by the State Mapping Advisory Committee, the Public Service Board was approached to set up a committee to investigate possible organisation of a series of courses on aerial photographic interpretation. This committee comprised representatives from all the interested Government Departments. It recommended initiation of three courses. Two of these are:—(i) An Orientation course to acquaint senior departmental officers of the varied uses of photo interpretation in investigating new fields, in increasing work capacity and accuracy, and in reducing costs; (ii) an introductory seminar course to acquaint senior field officers and key personnel with advances in techniques, and to introduce them to methods and uses made by other departments.

Sub-committees were formed to investigate (i) and (ii). These sub-committees have produced their reports. The reports will shortly be discussed at a full committee meeting.

Rylstone Survey.—The final draft of this survey is being currently checked before despatch to the printer.

Hawkesbury Soil Salt Survey.—This report is in its penultimate draft. It will be completed before the end of 1965.

MISCELLANEOUS, SOILS WORK

Citrus Nutrition Experiment, Narara.—In addition to the analyses reported last year, on the soils from this experiment, total nitrogen and exchangeable copper analyses were done. The outcome of all analyses have been collated and examined. The results are now under the Biometrician's attention.

Manganese Toxicity.—The sulphate of ammonia x lime factorial experiment with French Beans at Terranora Vegetable Research Station progressed through two harvests in 1964. It is continuing in 1965.

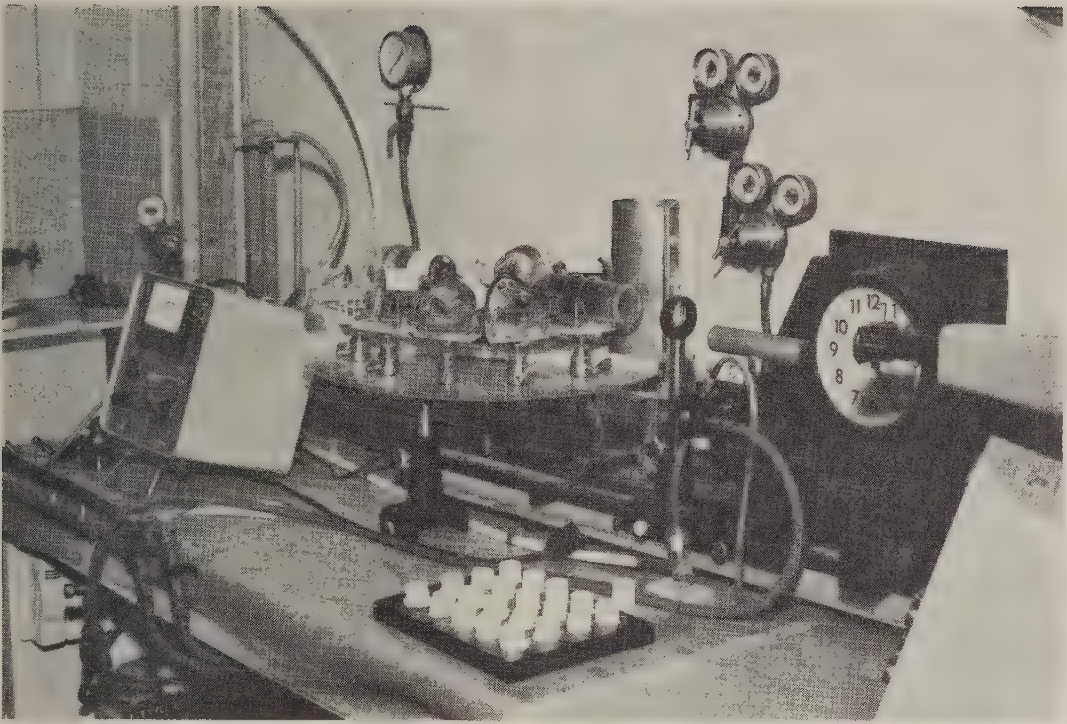
Plot soils were sampled three times and plant material twice. The soils were analysed for manganese and pH. The plant material was analysed for manganese, calcium, potassium, magnesium and zinc. Soil pH and soil levels of water soluble and exchangeable manganese showed a relationship. So, too, did soil pH and yield of beans. But bean yield and available soil manganese relationship was not shown.

Manganese toxicity symptoms have always been most pronounced in the "nil lime" treatments. There has been no indication that increased sulphate of ammonia increases manganese toxicity symptoms or lowers the pH drastically after one or two applications.

Higher pH induced by lime treatments has been of short duration, probably due to these soils' high buffering capacity.

Soil Analysis for Fertility Investigations.—Some 1,400 routine samples were analysed this year, compared with 800 last year. These were from agronomists, farmers, orchardists and home gardeners. The range of purposes comprised pH, available phosphate, per cent total nitrogen, salt content; and exchangeable sodium, potassium, calcium, magnesium, hydrogen and aluminium. A thousand samples were analysed for available phosphorus, compared with 600 last year. Eighty were analysed for exchangeable potassium, compared with 40 last year. Much of the instrumental work was done with the Beckham spectrophotometer.

Wheat Soil Nitrogen Studies.—Studies to find a suitable soil test to predict the nitrogen fertilizer need of wheat soils were initiated. This work is increasingly important, as wheat soil testing for phosphate becomes more common.



Analysis by Atomic Absorption Spectroscopy

This has been an outstanding addition to methods in the Chemistry Branch, Division of Science Services. For example, this year the Plant Nutrition Section used it to analyse not less than 2,000 specimens for calcium, magnesium, sodium, potassium, zinc, manganese and copper

YANCO RESEARCH LABORATORY

RICE CHEMISTRY

Preparation for Fertilizer Advisory Service.—Early in the season some 350 soil samples were obtained from district rice farms, with agronomist co-operation. The samples were analysed for ammonium nitrogen after incubation. Fertilizer rates were deduced from the results. This work is to develop a district fertilizer advisory scheme for rice. It is a continuation of investigations made over several years.

The number of farms sampled has gradually increased. Results have shown that response to fertilizer decreases as the level of incubated nitrogen rises; and that under similar conditions and with the same variety of rice, correlations between grain yield and nitrogen supplied to the plant are high. Fertilizer application, where needed, can increase the monetary value of a crop by more than one thousand pounds. Interest in the incubation test has been shown by the rice industry and the fertilizer industry. In the coming season, co-operative testing with one of the fertilizer companies is likely.

Development of a number of crops was followed this season. Soil ammonium levels were determined on several occasions; and water levels, plant growth and plant density were noted. Mid-season uptake of nitrogen was measured. The generally cool conditions resulted in low levels of uptake, from 20 to 60 lb nitrogen per acre, even though soil ammonium levels had been reduced to 5 p.p.m or less.

Mid-season application of 110 lb nitrogen per acre stimulated plant growth and resulted in an average increase in grain yield of ¾ ton per acre over all the plots harvested. The highest increase was 1½ tons per acre. In general, high fertility soils gave relatively small increases.

Total nitrogen uptake of crops was less than had been expected as a result of previous work in experimental crops.

Zinc.—Preliminary figures indicated a generally low content of zinc in plants and grain. This calls for further work.

Culinary Evaluation of Rice Crossbreds.—Evaluation of crossbred rice varieties for cooking quality revealed few with properties needed by the long grain market.

FRUIT CHEMISTRY

Statistics of Analyses.—This year, some 2,900 analyses were done on leaf samples from citrus and peach orchards under research. Of this total, 312 determinations concerned calcium, magnesium, sodium and potassium; 288 concerned boron and chloride; 168 concerned manganese, copper, iron and zinc; and 144 concerned nitrogen, phosphorus and potassium.

Peach Nutrition Studies.—Analyses were completed in peach nutrition studies; for calcium, magnesium, sodium, potassium, boron, chloride, iron, manganese, copper and zinc. The samplings were from 23 orchards on the M.I.A., during two seasons. Assessments are proceeding.

Citrus Nutrition Studies.—Analyses for nitrogen, phosphorus, potassium, calcium, magnesium, sodium, boron, chloride, iron, copper, zinc and manganese were completed on citrus leaf samples collected from 10 sites in the M.I.A., from Valencia and Navel orange trees on trifoliata rootstock. From each site, two sets of samples were taken: (*a*) non-fruiting spring flush terminal leaves, (*b*) matured leaves over a period of three years. The results have been assessed.

Botany Branch

NATIONAL HERBARIUM, ROYAL BOTANIC GARDENS AND ALLIED ACTIVITIES

NATIONAL HERBARIUM

National Herbarium services were maintained at a high level.

Staff.—Botanical staff was brought to full establishment with an appointment to the one vacancy.

Much of senior officers' time was occupied by preliminary planning of a new Herbarium building, to house expanding collections and staff over the next fifty years.

Botanical Research—Contributions from the New South Wales National Herbarium, Vol. 3, No. 5, containing "A Monograph of the Genus *Lastreopsis Ching*" by Mary D. Tindale, was published. Vol. 3, No. 6, containing two papers, "Supplement to the Key to the Genera of Rhodophyceae (Red Algae) Hitherto Recorded from Australia" and "A Census and Key to the Species of Rhodophyceae (Red Algae) Recorded from Australia", both by Valerie May, is at a late proof stage.

Four sections of the Flora Series have been submitted for printing, viz., Nos 24-25 (Flagellariaceae, Restionaceae), Nos 27-28 (Xyridaceae, Eriocaulaceae), Nos 30-31 (Pontederiaceae, Phylidraceae) and No. 34 (Xanthorrhoeaceae).

Contributions from the New South Wales National Herbarium, Vol. 4, No. 1, has been submitted for printing. It contains the following eight research papers:—"The *Xyris gracilis* Complex", by O. D. Evans; "Bleeser Specimens in the National Herbarium of Victoria," by J. H. Willis; "A New Species of *Agrostis* from the Australian Alps", by Joyce W. Vickery; "Algae of the Gilbert Islands", by Valerie May; "Further Records of Algae from New Caledonia, Collected by Mrs R. Catala", by Valerie May; "New Species of *Acacia* from Eastern Australia, I", by Mary D. Tindale; "Chromosome Numbers of Some Australian Monocotyledons", by Barbara G. Briggs; and "Notes on *Xanthorrhoea* in Eastern Australia", by Alma T. Lee.

Mary D. Tindale's description of a new species of *Acacia* (*A. beckleri*) known from the Barrier Range in New South Wales and the Gawler and Flinders Ranges in South Australia, has been published in the "Supplement to J. M. Black's Flora of South Australia" by Hj. Eichler (1965). Dr Tindale has revised her key to the bipinnate species of *Acacia* for the new edition of R. H. Anderson's "Trees of New South Wales". Eleven further species and subspecies, described since the last edition, are being incorporated. A monograph on the *Acacia decurrens—A mearnsii* group is in preparation.

Other studies in *Acacia* include one for a re-classification of the genus, with special reference to the relationship of the Australain species to those in Asia, Africa and America. A joint project on correlation of the chemical taxonomy and morphology of certain species of *Acacia* in the Phyllodineae and Botryocephalae is in hand, in association with Dr D. B. Roux, Leather Industries Research Institute, South Africa.

Revisions of the *Dillwynia retorta* group and of several small groups of *Pultenaea* spp. are in progress.

Studies on the remaining families of the *Pteridophyta* for the "Flora of New South Wales—Ferns of South-eastern Australia" are continuing. The genus *Cheilanthes,* in particular, is being revised.

A new classification of the genus *Eucalyptus* is being prepared in collaboration with Professor L. D. Pryor of the Australian National University, Canberra.

Taxonomic studies are in progress on the families Juncaceae, Casuarinaceae, Proteaceae, Commelinaceae, Cyperaceae, Centrolepidaeceae.

Cytotaxonomic investigations are being made in the Proteaceae, Restionaceae, Mimosaceae, Typhaceae, Xanthorrhoeaceae, Commelinaceae, Ranunculaceae, Cyperaceae and in several genera of ferns.

Specimens from the Tweed River that had been referred to *Planchonella linggensis* by an overseas specialist have been shown to belong to *P. chartacea,* a rainforest tree species extending into Queensland. This cleared up a puzzling record; since *P. linggensis,* known from many parts of Malaysia and Melanesia, was nowhere known in Australia except for that supposed Tweed River occurrence.

Several hitherto unclassified specimens of an *Asperula* sp. in the Herbarium have now been identified as *Asperula charophyton.*

Specimens of an apperently undescribed species of *Lepidosperma,* twice collected recently at the foot of Blue Mountains cliffs, are being investigated.

The herbarium collections of the genus *Polycarpaea* have been sorted.

Dr B. G. Briggs studied specimens of *Xyris* and *Typha* at the National Herbarium, Victoria. Her information is now being applied to problems in the nomenclature of species of both groups, and to distribution and variation questions. In *Typha,* comparisons were also made between Australian and non-Australian material. Specimens of several other groups were also examined, notably *Ranunculus* and *Polycarpaea.*

Cytotaxonomy.—Material of an unusually large form of *Poincirus trifoliata* was found to be a tetraploid.

New Zealand species formerly placed in the genus *Veronica* have for years been generally regarded as a distinct genus, *Hebe,* distinguished by morphological features and different chromosome number. A chromosome count of an Australian species generally referred to *Veronica* showed that it has a number characteristic of the New Zealand species of *Hebe.* Thus, further study of the generic position of the Australian species is needed.

Cytological studies contributed a lot also to solution of problems in the families recently written up for publication in the "Flora of New South Wales".

Cytotaxonomic work has also been carried out on species of *Typha, Acacia,* several fern genera, and members of the Commelinaceae, and Cyperaceae. Specific cytological projects on the Ranunculaceae, Restionaceae, and Proteaceae were continued, and various botanists' special collections from field work in New Guinea, Tasmania and Victoria were examined.

Field Investigations.—Plantings of *Citrus* and *Poincirus* at Narara, Somersby and Dooralong were examined. Material of an unusually large form of *Poincirus trifoliata* was collected and a chromosome count showed this to be a tetraploid.

In association with Professor L. D. Pryor, Australian National University, *Eucalyptus* were studied and collected in north-western, northern and central Queensland. Some little known species were located, and useful information on variation in and field relationships of other more widespread species was acquired. The intention is to develop a new system of classifying Eucalyptus. Tasmania and Victoria were visited for the same purpose.

In Glenfield and Liverpool districts material of *Eleocharis* and *Sagittaris* were collected for taxonomic and cytological study.

Brisbane and district were visited for field observation on *Xanthorrhoea* and botany discussions at Brisbane Herbarium. Queensland populations of *Xanthorrhoea* showing different trends from N.S.W. plants known under the same names, and intergradants between species, and the strong habitat preferences of these plants were observed. The knowledge gained is reflected in the treatment of this group in the "Flora of New South Wales" (in press).

In the Como and Royal National Park districts the extent to which species in the *Conospermum taxifolium* group are limited ecologically was studied.

The Sydney National Herbarium's representative attending the official opening of the new Herbarium at Lae, New Guinea, spent several days in the field with other botanists, in the Moresby, Wau-Bulolo, Lae and Eastern Highlands areas. Useful information and material was collected.

Plant Species New to N.S.W.—A specimen of a weed spreading in a Fitzroy Falls garden is believed to be *Aegopodium podagraria,* "Ground Elder", one of the family Umbelliferae. A persistent garden weed in England, it has not previously been recorded here.

Plants tentatively identified as *Sagittaria graminea* var. *weatherbiana* were in considerable quantity on the George's River banks near Casula and Liverpool. The variety is native to south-eastern U.S.A. *S. graminea* has not been reported before in New South Wales.

Eragrostis tenuifolia is now regarded as naturalized in this State. Specimens have been obtained from roadsides near Murwillumbah and Urunga.

Ligustrum vulgare, "European Privet", not previously recorded as naturalized, is said to be forming large clumps on basaltic soil in the Yarrowitch district. Other species of *Ligustrum* are spreading seriously in gullies and choking out native shrubs, and *L. vulgare* may do the same. The abundant small succulent fruits cause rapid spread.

Parsonsia latifolia, a rainforest climber previously known only from Queensland, has now been collected from several localities in the Clarence and Richmond Rivers districts.

Cyperus procerus, a Sedge not previously known to occur in N.S.W., has been collected between Kyogle and Horse Station Creek.

Cynodon hirsutus, not previously known in N.S.W., has been forwarded from Ben Lomond, New England. This is a South African species of Couch Grass. It differs from Common Couch in spreading entirely by surface runners (stolons) and does not have underground rhizomes. It is now under test in the Royal Botanic Gardens for use as a lawn grass.

Pennisetum purpureum, "Elephant Grass", must now be considered naturalized in this State on evidence from the Stott's Creek area, north coast. From previous specimens it was not possible to judge whether they were cultivated or naturalized.

A specimen of *Stenopetalum sphaerocarpum* from 120 miles south of Menindee has provided the first substantiated record of this species in New South Wales. A member of the Cruciferae, it occurs in Victoria and Western Australia.

Leycestera formosa has been found naturalized at Mount Wilson. It has been recorded previously from Tasmania.

Rare Species and Extensions of Range.—*Tetraria capillaria* has been received from the Forster district; the only previous collection known came from Royal National Park, though the species is in Queensland, Victoria and Tasmania. Though reported as a weed, it appears to be merely part of the natural vegetation of the area and unlikely to be troublesome.

Xyris ustulata has been obtained from the Barren Grounds Reserve, west of Kiama; its previously known southern limit was above Bulli Pass.

The rarely collected *Loeseneriella barbata* has now been obtained from some localities northwards of the Clarence River.

An undescribed species of *Parsonsia,* known from only one previous collection, has been found in the New England National Park.

Polyalthia nitidissima, a rainforest tree previously known in N.S.W. only from near Ballina, has now been obtained from several coastal localities extending as far south as Iluka.

Ailanthus malabarica, a large rainforest tree previously not known to occur south of the upper Richmond River, has been collected at Iluka.

Rhysotoechia bifoliolata has been collected near Ellenborough in the Hastings River system. This rainforest tree was previously known only from the Macpherson Range and from the Myall Lakes and Hunter River valley. The new record helps to fill a large gap in its known distribution.

Darwinia peduncularis has now been collected near Wentworth Falls, the first record of it outside a limited area between Hornsby and Berowra.

Drosera burmanii has been obtained from Cooyal, 15 miles north-east of Mudgee. In N.S.W. it was previously known only from Boonoo Boonoo and the Hawkesbury Agricultural College, Richmond.

The fern *Polystichum formosum,* not previously known to be between Murwillumbah and Minnamurra Falls (near Jamberoo), has now been collected at Gulf Creek, Sunny Corner, east-north-east of Bathurst.

Mucuna gigantea, a woody climber, was collected near the mouth of the Bellinger River, a southwards extension.

A specimen of *Pultenaea petiolaris* from Barcoongere State Forest near Woolgoola represents only its fourth record in this State.

Planchonella laurifolia was collected at Brunswick Heads; the second N.S.W. specimen of it recorded by the Herbarium.

Notothixos cornifolius parasitic on *Heritiera* was collected near Lismore; the first note of *Heritiera* as a host for it.

Amylotheca dictyophleba was collected at Brunswick Heads. Normally an aerial parasite, this mistletoe specimen was a small tree with a stem several inches in diameter.

Collection of *Symphionema paludosum* from Kanangra Tops extends westerly the known range of this coastal species.

Specimens of *Typha latifolia* collected in Tasmania provided the first known naturalization record of this Northern Hemisphere species in Australia.

A *Banksia* sp. from Kybean, hitherto unidentified and thought conceivably to be of hybrid origin, has now been correlated with a new species shortly to be described by Mr J. H. Willis of the National Herbarium, Melbourne.

Najas marina ssp. *armata* was received from the Griffith area. It was forming dense submerged masses in a dam. Its only previous record within N.S.W. was from Myall Lakes and Maria River on the north coast. The plant may prove troublesome.

A specimen of *Tylophora woollsii* from Cloud's Creek, north coast, is only the second record of this native climber; originally described from Parramatta district almost a century ago.

Hakea microcarpa was collected at Moran's Crossing, Bemboka district; a coastal locality. All previous collections in this region have been from the tablelands.

Hakea teretifolia was obtained from Nelson Bay, extending its known distribution northwards.

Banksia paludosa was collected near Mount Coricudgy; the previously known northernmost limit was Mount Wilson.

Ethulia conyzoides was received from East Coraki; the only previous record for N.S.W. is Richmond River, in 1887. A native annual herb, it occurs in Queensland where it is said to be a common weed of tropical gardens; it extends to tropical Asia and tropical and extra-tropical Africa.

Porana sericea, a climber of the family Convolvulaceae, has been collected at Mount Oxley, near Bourke. Collected only twice before, in the Cobar district, it has not been located for some 50 years.

Specimens collected at Bald Rock Mountain, 15 miles north of Tenterfield, appear to represent a hybrid of *Eucalyptus deanei* and *E. scoparia.* The latter is a species of restricted distribution, known from similar habitats just over the Queensland border but not recorded in recent times from New South Wales.

Macrozamia spiralis was collected near Glen Davis. This cycad has not previously been found outside the central coast and Hunter Valley areas.

Carex echinata (family Cyperaceae) was found at Clarence on the Blue Mountains; previously it had been recorded only from Guy Fawkes in the New England district and from the Australian Alps. Two other members of the Cyperaceae, *Scirpus calocarpus* and *Schoenus latilaminatus,* from Mulwarrina Creek about 35 miles south of Bourke, have not previously been recorded from the western plains.

Poison Plant.—The stomach contents of a dog believed to have died of plant poisoning at Carlton were found to include about 40 fruits of the commonly cultivated garden shrub *Brunfelsia bonodora* (family Solanaceae). This is the second case of *Brunfelsia* fruits implicated in poisoning of a dog. The other case, also at Carlton, was in 1951.

Special Identifications.—Seeds of *Cannabis sativa,* "Indian Hemp", were identified for the Police Department Drug Squad on several occasions. Court evidence was given on charges consequent on the enquiries.

At the request of the Bouddi Natural Park Trust, plants growing near the Park's Visitors' Centre were identified. The Trust intended to label the more conspicuous for visitors' information.

The Australian Meat Board submitted meat samples for identification of seeds embedded in the subcutaneous layers. Fruits of *Aristida* sp. were abundant, with *Stipa* (two spp.), *Vulpia* sp., *Hordeum leporinum* and *Agropyron scabrum* also present.

For the Police Department, four species were identified in plant fragments adhering to a pair of shoes.

Thirty-one voucher specimens, of nineteen species, were identified for Chemistry Branch in connection with analyses of protein content. The specimens were from Moree district. Drought was accentuating the need for suitable feed from hardier elements of the vegetation.

Exchanges.—Exchange of botanical specimens with other institutions was maintained, but staff shortage hindered specimen despatches; 2958 specimens were received from 19 institutions, and 793 from eight overseas institutions. Twenty specimens were forwarded to one Australian institution, and 355 specimens to nine overseas institutions.

Also, 321 photographs of fern Type Specimens came from the Smithsonian Institute, U.S.A., on exchange basis.

Field Collections and Seed Exchange.—314 packets of seed were received, from thirty-six Australian and overseas institutions; 185 packets were forwarded, to 40 institutions.

Living plants of *Tmesipteris billardieri* and several Australian members of the Hymenophyllaceae were consigned to the Royal Botanic Gardens, Kew, for the new Filmy Fern House.

Cytological material of *Restio complanatus* was supplied to Dr J. L. Guignard, University of Paris.

Material in fixative of 12 genera of the Proteaceae was supplied to Dr D. Rao of Osmania University, India.

Material of *Callitris macleayana* for cytological study was forwarded to Dr J. B. Hair, Botany Division, D.S.I.R., Christchurch.

Microstrobus and *Podocarpus* wood samples were sent to Dr P. Gregus, Botanical Institute, Szeged, Hungary.

Pollen samples of 30 species of the Restionaceae were supplied to Dr P. Chanda, Palynological Laboratory, Sweden.

Botanical Collector.—This officer, previously known as Seed Collector, now has extended duties; to obtain specific plant material for cytological and morphological investigation. He spent 67 days in the field, including four major trips to the south coast, central tablelands, Riverina, and Victoria, collecting seeds, herbarium specimens and specialized plant materials required by the botanists, cytologist, and other Australian herbaria or overseas botanists.

Lectures, etc.—Lectures on the work and history of the Royal Botanic Gardens and National Herbarium were delivered to Campsie Rotary Club, Women's Natural Health League, Denistone Ladies' V.I.E.W. Club, Ashfield Branch of the Country Women's Association, and Oatley V.I.E.W. Club.

Dr Sato of Japan and groups from Illawarra Natural History Society, St George District Horticultural Society, Sydney Boys' High School Ladies' Auxiliary, University of New South Wales, and Bethlehem Ladies' College, Ashfield, were conducted around the gardens.

Proposed New Herbarium Building.—An amount of £2,000 was allotted on the Loan Vote to provide for preparation of plans for extension of the building. An intra-departmental committee was set up to draw up proposals. The site around the present Herbarium building and Director's Residence was surveyed by Department of Public Works in December, 1964. That Department has since engaged in drawing up sketch plans.

Visitors.—The many notable visitors provided with facilities at the National Herbarium and Royal Botanic Gardens during the year included:—Mr J. B. Williams, University of New England, Armidale; Mr G. Chippendale, Animal Industry Branch, Northern Territory Administration, Alice Springs; Mr N. Barr, Farm Forest Association, New Zealand; Dr T. Walker, University of Newcastle; Mr A. C. Jermy, British Museum (Natural History) and Mr Eddy, British Museum (Natural History)—University of Newcastle Scientific Expedition; Miss A. McCusker, University of Ghana; Professor L. D. Pryor, Australian National University; Dr S. T. Moar, D.S.I.R., Christchurch, N.Z.; Miss J. Vessey, University College, Townsville; Mr V. C. Davies, Horticulturist, New Plymouth, N.Z.; Dr W. W. Bryan, C.S.I.R.O., Brisbane; Dr T. C. Whitmore, Forest Botanist, B.S.I.P.; Dr H. Doing, Division of Plant Industry, C.S.I.R.O., Canberra; Dr D. J. de Laubenfels, Syracuse University, U.S.A.; Dr H. S. McKee, Service des Eaux et forets, Noumea; Miss Mervyn Davies, Landscape Architect, Department of Works, Melbourne; Miss J. Anthony, British Broadcasting Corporation; Mr D. R. Horsley, Colonial Sugar Refining Co., Fiji; Mr J. M. Matthews, Department of Geography, Australian National University, Canberra; Dr M. E. Phillips and Miss Ponniah of the Parks and Gardens Section, Department of the Interior, Canberra; Mr J. Green, Australian National University, Canberra; Mr A. G. Floyd, Forestry Office, Coff's Harbour; Professor Sato, Landscape Architecture, Tokyo, Japan; Mr C. Burgess, Parks and Gardens Section, Department of the Interior, Canberra; Dr Chew Wee Lek, Curator of the Herbarium, Singapore; Dr W. D. Andrew, C.S.I.R.O., Canberra; Mr van Balgovy, Rijksherbarium, Leiden; Dr L. J. Brass, Archbold Biological Station, Florida; Professor Tsien Cho-Po, Institute Botanicum Academia Sinica, Peking, China; Dr Hj. Eichler, State Herbarium, Adelaide; Dr L. Bernardi, Conservatoire Botanique, Geneva; Professor A. Aubreville and Dr R. Heine, Museum National d'Histoire Naturelle, Paris.

Sir George Taylor, Director, Royal Botanic Gardens, Kew, guest of the National Herbarium for three days while en route to and returning from opening the new £100,000 Herbarium at Lae, New Guinea, was taken also to Centennial Park, Botany Bay and local relics of sandstone and sand-dune vegetation, and to the Blue Mountains to acquaint him with aspects of the flora of the Wianamatta Shale, Hawkesbury Sandstone and Permo-Carboniferous series.

General.—In the last few years enquiries on availability of various species of algae (seaweeds) which might be exploited commercially for the production of agar or algin have increased. Identification of numerous specimens and general advice has been provided by Mrs V. Jones, Honorary Algologist.

Mr E. Gordon, an experienced amateur orchid grower has rendered voluntary assistance in the maintenance and reorganization of the Herbarium collections of the Orchidaceae.

A collection of insect gall specimens long housed in the Herbarium has been handed over to the Entomology Section of the N.S.W. Forestry Commission. Many of the gall-forming insects had been identified by former Developmental Entomologist W. W. Froggatt.

Dr Mary D. Tindale was appointed a member of the International Committee of Botanical Nomenclature, Special Committee for Pteridophyta, at the Tenth International Botanical Congress held in Edinburgh in August, 1965. The committee of eight, in office until 1969, will between congresses deal with *nomina generica conservanda* and other matters affecting fern nomenclature.

A list of plants collected by Banks and Solander at Botany Bay in 1770 was prepared for the La Perouse Peninsula Fauna and Flora Protection Society.

The Senior Botanist, Dr J. W. Vickery, prepared an illustrated report on "Observations on Plant Regeneration in the Snowy Mountains". Copies of this comprehensive ecological assessment of the situation were distributed to interested bodies.

A party led by the Minister for Mines to inspect the Iluka Rain Forest, north coast, was assisted. Following this the Government determined that this unique development of vegetation should be protected as a reserve, and rutile mining limited in the environs.

ROYAL BOTANIC GARDENS

Despite unfavourable seasons general maintenance continued at a high standard and some improvements were effected.

Improvements.—The more important improvements were:—re-alignment, reconstruction and kerbing of some major roadways; reformation of pathways; widening and reforming of grass verges; concrete surrounds for shrubberies; renewal of storm water drainage; removal of two embankments from the main pond, and regrading and grassing of the area; desilting of a waterway; further removal of unsuitable and much duplicated material and replacement with new introductions including thirty species of trees not previously represented; re-design planting of shrubberies; continued re-seeding of areas denuded through heavy shade; establishment of 10,000 square feet of turves in part restoration of the area where the main entrance to the Gardens was resited; and additions to the turf grass demonstration area, bringing to 29 the total of species and varieties now displayed there.

Nursery.—The range and quantity of material under production was further increased, by propagation of local and overseas introductions which exceeded 400 species. The range reached a peak of some 1,800 species and varieties, in the 12,000 plants held. The variety grown probably exceeds that likely to be grown by any commercial nursery in Australia and the quality compares more than favourably. The range includes a large selection of native species. Some 200 of these have recently been raised in readiness for extensive future plantings—part of the programme to increase the number of species in the Royal Botanic Gardens.

Release of plant introductions of merit continued, to reputable nurserymen for commercial production. One such release, *Sabina pachyphloia* var. *deppeana* a steel blue Conifer has proved so popular that nurseries are unable to meet demand.

Facilities for plant production continued to improve, through the purchase of mist propagation units, a soil compost shredder and a soil pasteurisation unit.

Glasshouse Section.—Few changes occurred. The various seasonal displays of flowering and foliage plants were satisfactory. The condition of a number of houses is deteriorating rapidly and detracts from the appearance of the area. These houses, very old, fall far short of modern standards.

Completion of minor structural modifications of the large aluminium glasshouse by Public Works Department permitted an outstanding display of florist's chrysanthemums. They brought very favourable comment and increased public interest.

Decorative Plants and Displays Supplied.—Provision of plants and floral decorations for the Opening of Parliament and to decorate official rooms of the Royal Agricultural Society at the Easter Show continued; also the supply and maintenance of foliage plants to Government offices. Decorative plants were supplied and arranged for the official opening of Prince Henry Hospital.

Landscape Designing.—Diversion of the Landscape Designer for duty as Acting Superintendent, Centennial Park for part of the year, and delayed additional assistance in this section adversely affected a number of major replanting and landscape improvement schemes, especially those associated with areas affected by construction of the Cahill Expressway. The programme of improvements envisaged in readiness for the forthcoming National Conference of the Australian Institute of Park Administration is also in arrears.

The black-log of landscaping for Government and semi-Government institutions is now being overtaken, following recent appointment of an additional Landscape Designer. But requests for help in design problems steadily continue. Demand for this service seems likely to increase, particularly from country centres.

Plans and/or reports were completed for landscape treatment of:—Ashcroft High School, Allambie Heights Public School, Lindfield Public School, Thornleigh Child Welfare Establishment, Camphill Park, Drummoyne Council, and the Presbyterian Church of Australia, Ebenezer.

Landscape improvements associated with the restoration and development of Centennial Park as approved by the Centennial Park Supervisory Committee were directed, and surveys connected with reconstruction and re-alignment of major internal roadways of the Gardens were undertaken. Also, a rockery at Government House was redesigned and planted and a plan showing proposals for landscaping the area of the Main Entrance off Mrs Macquarie's Road was prepared.

For the University of Sydney, a series of lectures was delivered by the Senior Landscape Designer to post-graduate students in Town Planning.

General.—The Director and Chief Botanist and Assistant Superintendent attended the 38th National Conference of The Australian Institute of Park Administration, in Brisbane from 4th to 10th April, 1965. The Conference approved holding the 1966 Conference in Sydney under the sponsorship of the Department.

The inaugural meeting of the New South Wales-Australian Capital Territory Branch of The Australian Institute of Park Administration was held at the National Herbarium. Assistant Superintendent, Mr W. Watson, was elected foundation President, the Director and Chief Botanist a Vice-President, and the Senior Landscape Designer, Honorary Secretary-Treasurer. The Institute aims to:—promote co-operation and mutual assistance between members; encourage study of matters associated with the development and management of public parks, open spaces and allied recreational areas; improve standards of technical knowledge and efficiency of persons so employed; assist establishment of higher educational courses for park personnel; and provide lectures and other educational facilities for members.

The Assistant Superintendent also attended the 21st Annual Conference of The Australian Federation of Nurserymen's Associations held in Hobart where he made valuable contacts with members of the nursery industry.

Staffing Difficulties.—There were 28 resignations from the gardening staff, 33 appointments, and two officers transferred to other service positions.

A number of casual labourers were engaged throughout the year for short-term employment. High turnover of gardening staff and difficulty in recruiting suitably experienced staff has made virtually impossible any continuity in projected improvements.

CENTENNIAL PARK; INCLUDING QUEENS PARK

Additional Funds.—The Centennial Park Supervisory Committee was provided with a special vote of £30,000 for restoration and development work in Centennial Park and Queen's Park. This was in addition to funds provided as in former years for general maintenance. However, the latter have been severely limited over a long period of years and it has not been practicable to satisfactorily maintain the whole of the areas. Much clearing-up work had to be done before development schemes were undertaken.

New Machinery.—Some £5,000 worth of machinery was purchased. This facilitated the improvement work.

Buildings.—The depot buildings were partly replaced by a modern structure. It is anticipated other old buildings will be renewed in the coming financial year. A new toilet block for the staff was constructed in brick. The whole depot area is now surrounded by a metal security fence. Grass turves were planted over an area disturbed by the construction of buildings and the fence.

Riding Track.—The two-and-a-quarter mile horse-riding track, source of complaints by riders, was completely re-graded. The accumulated mixture of surface materials was replaced by a six-inch deep sand track. Watering facilities to be installed this year will enable it to be well maintained.

Damaged areas bordering the newly-renovated riding track have been regrassed by seeding, and by turves between trees.

Landscaping.—The main developmental scheme initiated is the landscaping of a previously unkempt south-western corner of Centennial Park subject of public criticism over a number of years. This area borders part of the Grand Drive from which an approaching view may be obtained for some distance; an admirable section for landscaping. Excess growth of naturalised specimens of Cluster Pine (*Pinus pinaster*) justified their removal, though there was some public criticism. Over thirty remaining trees of this species will be incorporated as tree-lots in the final planting scheme envisaged. Water-mains have been laid in the area to facilitate establishment of grass coverage and plantings of shrubs and trees. Native species will be featured in the area. It will become a most attractive section of the Park. Ample ground, beyond this section, is being retained as a primitive area.

The Ponds.—Reed-growth, almost wholly of a native sedge (*Eleocharis sphacelata*), has extended over large areas of pond surface in most of the Park's eleven ponds. Action was taken to clear one pond in the central section of the Park, leaving sufficient reed to provide shelter for water-fowl, and to be satisfactory aesthetically. On damaged surrounding embankment, turf was laid, and the whole area has been restored to become a very attractive feature. Reed-clearance from other ponds will continue over the next few years.

Fencing.—Renewal of the old, unsightly park-rail fence surrounding Queen's Park has begun. It will be completed in the coming financial year.

Vehicle Parking.—Parking of vehicles contrary to the Regulations has developed over a number of years. It has become a major problem in sections of the Park adjacent to Randwick race-course and in the vicinity of the Royal Agricultural Society's Showground. At such times as race meetings and the Sydney Royal Show the Ranger is unable to prevent unauthorised parking. Erection of some physical barriers such as kerbing, to prevent vehicles from moving off the bituminised roadways onto grassed areas is under consideration. The Supervisory Committee considers urgent attention to this matter obligatory.

Reservoir Embankments.—Agreement was reached with the Metropolitan Water Sewerage and Drainage Board that maintenance of the embankments of all three reservoirs in the Park should be the responsibility of the Department of Agriculture. An initial payment of £1,000 was made by the Board to cover costs of the Department. Casual labour has been employed this year clearing the embankments of weed growth. Capital expenditure has been absorbed in surfacing the broad concrete steps, filling-in on the southern face of Centennial No. 2 Reservoir, and replacement of a missing chain-wire fencing section of this Reservoir's western border.

Fencing, etc.—A painter and carpenter have been assigned to full-time duty at the Park; but considerable fencing had to be re-erected following renovation of the riding-track, so two more carpenters from the Royal Botanic Gardens were employed there for a period. Likewise, for urgent work on metal fences, drains, and the water service, two plumbers from the Royal Botanic Gardens were occupied there for several weeks.

Roads Named.—Formerly only three roads were named in Centennial Park:—the Grand Drive, encircling the centre of the Park outside the riding-track; Parkes Avenue, a through road in a north-south direction; and Dickens Road, running in an east-west direction across the centre of the circle formed by the Grand Drive.

All roads have now been named. Thoroughfares now bear the titles of the several Colonial Governors present at the dedication of the Centennial Park on Thursday, 26th January, 1888. The terms Drive or Avenue have been used throughout, and the roads are now known as:—

Parkes Drive, after Sir Henry Parkes, Chief Minister of N.S.W.; whose statue is beside the roadway at its junction with Hamilton Drive;

Dickens Drive, after Charles Dickens whose statue is beside this roadway;

Jervois Avenue, after Sir Willam Jervois, Governor of New Zealand;

Hamilton Drive, after Sir Robert Hamilton, Governor of Tasmania;

Loch Avenue, after Sir Henry Loch, Governor of Victoria;

Robinson Drive, after Sir William Robinson, Governor of South Australia;

Musgrave Drive, after Sir Anthony Musgrave, Governor of Queensland;

Carrington Drive, after the Right Honourable Lord Carrington, Governor of N.S.W.;

Grand Drive, the original name of the main road that encircles the Park;

Broome Avenue, after Sir Frederick Broome, Governor of Western Australia;

Depot Avenue, the short access road to the Depot from Parkes Drive.

Sporting Facilities.—Centennial Park and Queen's Park were each used extensively by sporting bodies; for cricket, soccer, football, hockey, cycle racing, cross-country events and horse riding.

Fires and Drought.—Several grass fires occurred, apparently due to vandals. Two culprits were apprehended.

The long drought affected a number of trees. Palms withered badly. Rain late in the season revived most perennial growth and brought the water-level in the ponds to normal level. By the end of the drought two small and one large pond were completely dry, a phenomenon not recorded in the previous twenty years.

Domains

Improvements.—The areas were satisfactorily maintained. These included reformation of the pathway linking Mrs Macquarie's Road with the lower return road which runs from the Domain Baths to Art Gallery Road Bridge, and preparation and planting of the garden areas running parallel with the on and off loading ramps of the Cahill Expressway at the eastern end of the tunnel. Two fine bronze equestrian statues donated by the Art Gallery Trustees were erected on sandstone pedestals beside the Domain steps opposite the Art Gallery building.

Restorations.—The Sydney City Council has now commenced to implement the balance of work originally agreed upon as part of the programme of restoration of areas affected by the construction of the Domain Parking Station.

The irrigation system to the playing fields covering the roof of the parking station has been installed; also kerbing at the southern end of the Domain along St. Mary's Road footpath. Work on constructional modifications to the access situated adjacent to the playing fields is in progress.

The Playing Fields.—As usual these were in heavy demand by sporting bodies. Installation of the re-designed goal posts, constructed of light steel conduit, was subject to favourable comment. In all, facilities were provided for 190 Rugby League, 60 soccer, and 900 basketball games.

Conferences were also held with the Town Clerk and Council Officers regarding proposals for a new Domain swimming baths.

Electricity Sub-station Effect.—The Sydney County Council completed laying high tension underground cables in the Domain, from the recently completed sub-station to a point about mid-way between Art Gallery Road Bridge and the Law Courts. Further extensions are to be undertaken at a later date. Restoration of areas affected by construction of the Electricity Sub-station and the associated cable laying have been completed satisfactorily.

Vehicle Parking Effect.—A limited area of the Domain was again made available for the parking of shoppers' cars in the week preceding Christmas. Extensive grass damage occurred. Continuance of this parking practice is being reviewed.

Unrestricted parking on sections of the roadways near Mrs Macquarie's Point have contributed to traffic congestion in that area because of the restricted width of the road. A scheme has been formulated to afford adequate parking for visitors at all times.

The difficulty experienced last year in controlling unauthorised parking of vehicles on grassed areas particularly at periods when important art exhibitions are held at the Art Gallery was largely overcome by erection of temporary structural barriers. With anticipated re-opening of the lower or eastern section of Mrs Macquarie's Road and the re-introduction of one way traffic along Mrs Macquarie's Road in the coming year, and installation of road kerbing and regulated parking, recurrence of this problem is not expected. The temporary barriers, spoiling the landscape, will be removed.

Parades and Assemblies.—The Domain was again used for parades and procession assemblies in connection with Anzac Day, Australia Day, Apprenticeship Week, the R.A.S. Show, and the Waratah Spring Festival.

Planting of more young trees of various species was undertaken. Considerable attention needs to be given to this in the future. The deterioration of many of the once majestic Moreton Bay Figs is increasingly apparent.

Admiralty House and Government House

The operations were mainly general maintenance, and development of special floral displays for the Royal visits.

Some improvements were made at Government House. These included:—Redesigning and planting of the rockery beneath the great fig, adjacent to the south-eastern corner of Government House building; removal of old, superfluous trees and shrubs along the northern boundary of the grounds—for replanting with native species; and re-alignment of all lawns and garden beds.

Considerable work is still needed at Government House to bring the grounds to the desired standard.

DECENTRALIZED AGRICULTURAL RESEARCH DIRECTORATES

Agricultural Research Institute, Wagga Wagga

WHEAT IMPROVEMENT

Record Production

The dramatic impact of rising levels in fertility of the wheat-belt soils was again demonstrated in New South Wales' record production from a record acreage—yielding a record mean exceeding 26 bushels per acre.

The Contribution of Improved Varieties.—Improved wheat varieties have helped this production. Two varieties from this Institute, Heron and Falcon, have found a prominent place in the central and southern wheat zones. Meantime, breeders are developing improved strains of each. KF Heron and a loose smut-resistant line were further evaluated and nucleus seed stocks have been increased in anticipation of their release in 1966.

Increased Premium Purchases of Falcon.—The variety Falcon aroused some controversy soon after its release in 1960, but is now being accepted by the milling and baking trade in southern New South Wales. Premium purchases amounted to about 146,000 bushels last season, compared with 9,000 from the 1963 harvest.

Advanced Crossbreds

Yield Evaluations.—The season was a good one for yield evaluations. With additional testing sites, evaluation of twenty-six lines included in the larger plot trials was greatly advanced. Fifteen of the twenty-six were rejected, seven were continued and four were promoted for wider testing in 1965.

Semi-dwarf Crossbreds Outstanding Yields.—The semi-dwarf crossbreds again proved outstanding in yield. Mexico 120 recorded a mean plot yield of 94.0 bushels per acre at Cowra. It was outstanding in several trials conducted by other State Departments of Agriculture. Unfortunately, Mexico 120 is of low baking quality. Back-crossing to improve this is proceeding.

A second semi-dwarf crossbred, NBJ 115, a derivative of Javelin, was again outstanding. It set a further record yield for the Temora trials, 86.8 bushels per acre.

The crossbred Cross 7 x Curlew M1146 continued to excel in both yield and baking quality, but unfortunately it tends to be rather low in bushel weight. A major back-crossing programme to improve its grain finish has been commenced.

Grain Hardness Studies

Inheritance of Grain Hardness.—A comprehensive study of this has been completed and published.

Influence of Hardness on Baking Quality.—These studies to determine the influence are of special significance. A reciprocal back-cross programme with Heron and Falcon has been completed with six back-crosses in each direction. Both hard and soft lines of each type have been obtained. These are now undergoing baking quality evaluation.

Attempt to Transfer "Hardness" to Heron.—An attempt is being made to transfer "hardness" to the leading variety Heron, using a range of donor parents. Preliminary baking tests have been undertaken.

Breeding for the Irrigation Areas

In field trials in 1964 two semi-dwarf introductions showed yield potential at least equal to that of currently grown varieties. Also, they are resistant to the locally occurring races of stem rust. Unfortunately, both have had to be rejected because of poor baking characteristics.

The Victorian variety Pinnacle, widely grown under irrigation, has acceptable biscuit and bread manufacture qualities. It will be the standard of quality for future crossbreds.

An investigation of the physiologic and genetic control of plant height has shown that the semi-dwarf wheats derived from Norin types can be differentiated from standard varieties by their shorter growth as seedlings under low light intensity and by relative insensitivity to the growth substances glibberellic acid and C.C.C.

Phasic Development

Further genetic studies have revealed a second modifying gene in the Canadian variety Thatcher, which conditions the rather sensitive reaction of this variety when grown under short days. The "winter" character of Winter Minflor has also been shown to be governed by two genes. Each of these alone leads to development of "spring" characteristics.

The chromosome substitution technique is being used to identify the location of chromosomes which influence the difference in vernalization requirement of the two varieties Hope and Chinese Spring.

A number of winter and semi-winter crossbreds have yielded well in mid-season plantings, but had to be rejected on quality considerations.

Cytogenetics

As part of a long-term approach to wheat improvement, several new techniques are being studied. These utilize the genetical variability in closely-related species and genera. Intervarietal chromosome substitution is also being examined, to determine its usefulness in the wheat improvement programme.

With continued losses from take-all (*Ophiobolus graminis*), the practicability of intergeneric transfers of take-all resistance needs determination. Lines of Heron bearing individual chromosomes from cereal rye will be available for testing at the end of the present season. A survey of a large number of species of *Agropyron* has revealed a useful resistance to take-all in the species *A. donianum.*

By the manipulative removal of chromosome 5B of bread wheat, it should be possible to pair the chromosomes of bread wheat and those of alien species. This has been achieved and for the first time a fertile cross has been made between *Triticum aestivum* and *Haynaldia villosa.* It points the way to the utilization of this distantly related species in wheat improvement programmes.

WHEAT QUALITY INVESTIGATIONS

Greater Scope and Speed of Quality Testing

The scope and speed of routine quality testing of small samples from early generation material have been increased by use of a new micro mill. Modification of the baking test has been planned, to permit rejection of lines with desirable quality characteristics at an even earlier stage in the breeding programme.

Basic Studies

Flour Sedimentation Studies:—These have been continued and promise a means of differentiating major wheat types. Gluten maturity appears to have a significant bearing. Investigation of this is continuing.

Role of Starch and Gluten Variables.—A study of the role of these variables in determining some major physical dough and baking quality characteristics has been completed with respect to the Institute's existing testing equipment; the Chopin Alveograph and the standard baking test.

This work has shown that major varietal differences in the Alveograph curve and test-loaf characteristics of a flour are closely associated with variations in the level of damaged starch and in the maturity of the gluten. "Overstability", a characteristic of flour from many wheat varieties, has been shown to be due to an inherent state of overmaturity, i.e., overoxidation in the gluten.

An extension of this work to other types of dough-testing equipment and an investigation of the possibility of developing an early prediction test for overstability in breeding material will proceed.

OAT IMPROVEMENT

Performance of Crossbred

The season's highlight was the performance of the crossbred (Fulmark x Ballidu) x (Dale x Fulghum) at the testing centres Wagga, Henty, Temora, Condobolin, Cowra and Yanco. Over the past four years this crossbred (F.B.D.F.) has outyielded all other varieties under light grazing with recovery for subsequent grain production. It is outstanding for rapid early growth, highly valued by graziers.

F.B.D.F. is moderately resistant to smut and shattering, early in maturity and has medium to strong straw. Foundation seed is expected to be made available to Registered Seed growers at the end of this season.

Record Yield

Record grain yields, over 140 bushels per acre, were obtained at Temora from the grain variety Avon as well as from the two crossbreds F.B.D.F. and Avon x Osage. Further tests with the Avon x Osage crossbred are necessary, particularly for grazing yields and grain quality,

Back-crossing for Quality

Rapid decline in popularity of Belar oats has raised a need to improve the grain quality of Avon. Therefore a major back-crossing programme to combine yield with milling quality has been started.

Phasic Development

Developmental patterns and internode lengthening are being studied in all recommended oat varieties. Delayed grazing beyond the optimum stage leads to losses in forage production, particularly with varieties which elongate rapidly. An estimate of likely losses from delayed grazing management would be a valuable guide in selecting new dual purpose varieties.

WEED INVESTIGATIONS

Factors Influencing Flowering in Skeleton Weed

This plant flowers in long days, but the response to day-length depends on the extent of prior low temperature vernalization and plant age. The critical photoperiod is slightly under 12 hours, and reduced to under 9 hours by four or more weeks exposure to low (5-10°C.) temperatures.

The flowering process seems to occur in two phases. The first, or photo-inductive phase, requires long days and is accelerated by low temperatures. The second, or thermo-inductive phase, becomes operative when bolting occurs and is accelerated by rising temperatures. This phase of development may be independent of daylength.

Testing New Herbicides for Skeleton Weed

A number of new herbicides were tested against skeleton weed at various application rates. In post-emergence application to wheat at the 6-leaf stage trichlorphenylacetonitrile at ½ to 4 lb per acre, and 2-methoxy-3, 6-dichlorophenylacetic acid at ½ to 2 lb per acre gave good results without adversely affecting yield. Picloram + 2,4-D (1:12) at 1.0 to 17.3 oz per acre gave excellent control of the weed and suggested some stimulation of wheat yield at the 2 to 4 oz rates of application. Ioxynil at ½ to 2 lb per acre gave reasonable control of the weed.

Results from the previous year indicated that temporary suppression of skeleton weed by several of the newer herbicides tended to increase wheat yields. Prolonged suppression of skeleton weed by picloram suggested that this herbicide could be useful in pre-sowing and pre-emergence application techniques. In post-emergence trials dicamba, at 2, 4 and 16 oz. per acre, picloram at ½, 1 and 2 oz. per acre and 2,4-D at 12 oz. per acre gave excellent weed control. However Picloram at 1 and 2 oz. per acre reduced wheat yield as compared to the control. A mixture of MCPA and *dl* alpha (2-methylphenoxy) propionic acid (RD-5838) and RD-5838 alone at 6, 12, and 24 oz. per acre had little effect on skeleton weed populations.

In pre-emergence trials picloram at 1 and 2 oz. per acre suppressed skeleton weed growth for 6 to 7 months. The 1 oz. rate significantly increased the grain yield of oats, but both rates reduced wheat yields.

CONTROL OF PATERSON'S CURSE (*Echium plantagineum* L.)

In post-emergence trials, 2,4-D at 8 oz. and above, dicamba at 10 oz. and above, prometryne at 20 oz. and above, and a 12:1 mixture of RD-5838 + MCPA gave better than 90 per cent control of the weed. 2,4-D + picloram mixtures were the most successful. All ratios stronger than 24:1 applied at 6 oz. per acre reduced Paterson's curse to negligible proportions. Ioxynil and RD-5838 alone were ineffective.

Ioxynil, prometryne and RD-5838 had no apparent effect on subterranean clover, but dicamba and the stronger 2,4-D/picloram mixtures eliminated it during the season of application.

SUGGESTED GROWTH STIMULUS BY TRIAZINE HERBICIDES

Reports of growth stimulation, particularly with respect to nitrogen uptake, from use of triazine herbicides suggested that these might be useful where skeleton weed reduced the nitrogen status of soils. Applications of 4 oz. of prometryne per acre to wheat at the 3-4 leaf stage increased grain yields slightly. The major effect was in an immediate increase in the leaf area of treated crops. This advantage in photosynthetic area, however, slowly disappeared as the crops grew to maturity. The experiment is being repeated and extended.

PASTURE HUSBANDRY

PASTURE UTILIZATION

A stocking rate (2, 4 and 6 dry sheep)/superphosphate rate (0, 1, 2, 3 cwt. per acre per year) trial was commenced in 1962. It will finish at the end of 1965. A cropping phase will then follow for three years. In this period the soil fertility levels of the various grazing treatments will be evaluated.

This trial is located on land of moderate to low fertility. The land had been cropped fairly intensively and had not been sown to sub clover and ryegrass prior to 1960. Responses to superphosphate were expected to be high.

While no firm conclusions can yet be made, the trend is interesting. In terms of wool production per acre, the stocking rate is by far the most important determinant, while superphosphate applications have had a relatively minor effect.

The following figures refer to average greasy wool weights, in lb. per head, for the 1963 and 1964 shearings:—

Number of Sheep Per Acre	Rate of Superphosphate Per Acre Per Annum				
	0	1 cwt	2 cwt	3 cwt	Mean
2	10·4	11·3	10·9*	11·3	11·0
4	9·6	10·6	9·8	10·1	10·0
6	9·3*	9·1	8·5	8·5	8·9
Mean	9·8	10·3	9·7	10·0	..

* One year only.

Superphosphate has increased available pasture markedly in spring but the small increase in winter production probably allowed extra wool to be grown on top-dressed areas.

The pasture composition changes are as expected: the change to grass dominance has occurred faster with increasing superphosphate rates and with decreasing stocking rates.

Although the district stocking rate is less than two sheep per acre, six sheep per acre were carried with ease through the 1964 autumn, and, with no green feed from December, 1964, to June, 1965, are still in good condition (average body weight 95 lb.).

Soil samples have been collected and analysed from all treatments each year. No treatment-induced differences in soil nitrogen, organic carbon or total soil sulphur have been detected over a period of three years. However during the three years the mean organic matter concentration of all treatments (0-4 inches) increased from 0.85 to 0.89 per cent.

This work will be expanded throughout the region over a range of rainfall patterns. It will be of interest to determine the applicability of the above results when larger flock numbers are examined.

PLANT PHYSIOLOGY

DROUGHT INVESTIGATIONS

Investigations into the measurement and analysis of both drought resistance and efficiency of water use of wheat varieties are being developed. A grant has been made from the Commonwealth Wheat Stabilisation Fund, to construct a plant shelter and field laboratory and for some equipment. These buildings will be functional by the end of the current year.

The information from these investigations should contribute to understanding the physiology of yield and also assist the breeding programme by providing a guide to the selection of parents.

In addition to the measurements of drought resistance and efficiency of water use, a method of surveying the condition of stomata in the field is being investigated and the relation between osmotic and physical potential in the uptake of water by plants is being studied.

AGRONOMIC SURVEY UNIT

Wheat Crop Variability.—Field data from the 1964 harvest period have enabled completion of a study of variability of commercial wheat crops. The results show that the level of sampling required for accurate yield assessment in crops is too high to be used as a routine technique.

Factors in Nitrogen Uptake.—Early studies to relate simple soil nitrogen assays on shallow soil samples to nitrogen uptake and crop yield have ceased. In 1964, a programme of deep soil sampling was commenced, to relate nitrogen uptake by crops, prior to onset of serious moisture stress, to changes in total mineral nitrogen content of the soil profile and to mineralization capacity of the surface soil. Results of these efforts were sufficiently promising to warrant continuation of this programme for at least two more seasons.

Association of Weed Infestation and Take-all.—In 1963 almost 25 per cent of all wheat crops in an area typical of the southern wheat belt were seriously infected with take-all. Analysis of survey data for that year has shown highly significant association between weed infestation and take-all incidence. It has been suggested that the high level of heavily weed infested crops was due to unsatisfactory seed bed preparation which would also have encouraged a carry over of the take-all organism.

SOIL TESTING PILOT SCHEME

Phosphate Fertilizer Needs of Wheat.—The pilot scheme was started in 1964. It is investigating the reliability of soil testing for estimating the phosphate fertilizer requirements of wheat. Whilst awaiting essential equipment only ten trials were established in the first year. Crop development observations in the form of tiller and head counts were made in August, September, October and November. Quadrat cuts to determine dry matter production at flowering were taken in October and a sample harvest was made in December.

Phosphorus determinations by the ammonium fluoride method were statistically examined to determine the minimum number of cores needed for a representative bulk sample with a phosphate analysis not differing by more than 1 p.p.m. from the true mean analysis of the population.

The 1964 experiments were not sufficient in number or spread to establish a well-founded correlation between soil phosphorus and yield. But the results of regressions calculated were encouraging. With nitrogen, correlation coefficients between 0.59 and 0.66 were recorded; but without nitrogen there was almost a random scatter of points.

The soil testing laboratory was completed towards the end of the year, and soil samples from trial sites have been analysed by ten different methods. The mobile mechanical unit for sowing and harvest of trials is now fully equipped and been proven satisfactory in the field.

Thirty trials have been established this season. These are over a much wider area and variety of climatic conditions and soil types.

SOIL CHEMISTRY

PHOSPHATE FRACTION STUDIES

Earlier studies on the fate of superphosphate applied to local soils had shown that the major portion of phosphorus added goes to the aluminium phosphate form, and that this fraction is the main source of supply of phosphorus for plants. Over a long period there is transfer of phosphorus from the aluminium to the iron phosphate form. Because of the importance of these two fractions the accuracy of their separation in the standard fractionation method was studied. Separation between the two was found to be not as accurate as desired. Therefore a method of applying a correction factor was evolved. This enables more precise delineation between aluminium phosphate and iron phosphate in soils.

A preliminary study of the phosphate fractions in soil which are extracted by some of the many chemical reagents used to estimate "available" soil phosphate gave indication of explaining why some of the reagents are more highly correlated with plant response than others.

METHODS OF SUPERPHOSPHATE APPLICATION

The superphosphate shortage of autumn 1964 led to many questions from farmers about the importance of the time and method of application of superphosphate to wheat. Two experiments investigated the advantages of broadcasting superphosphate before and after sowing, compared with the normal method of drilling with the seed. It was concluded that in most cases application of superphosphate with the seed at sowing will give the greatest return.

RATE OF PHOSPHORUS UPTAKE BY WHEAT

The rate of phosphorus uptake in a field crop of wheat was found to be 0.04 lb/acre/day for the 100 days between planting and jointing, 0.15 lb/acre/day for the 20 days between jointing and ear emergence and 0.07 lb/acre/day for the 27 days between ear emergence and milk stage. This rate of uptake late in the life of the plant was unexpectedly high.

An experiment was devised to investigate whether the changes in rate of phosphorus uptake were merely a function of time or an effect of stage of growth. Plants of Falcon wheat were grown in boxes and lighted for 8, 12 or 20 hours each day. In this way groups of plants were at varying stages of development at the time when the superphosphate applications were made. The results suggest that the uptake of phosphorus by the wheat plant depends more on stage of growth than on the actual time of application.

ROCK PHOSPHATE

The fact that supplies of rock phosphate from the island of Nauru will be exhausted in the near future has focussed attention on alternative sources of supply. The ability of imported basic slag and calcined rock phosphate to support plant growth were investigated and compared with that of Nauru rock phosphate and superphosphate.

Subterranean clover was grown in pot culture. Both basic slag and superphosphate were significantly better than the rock phosphates in producing dry matter increases in the clover. When wheat or clover were grown as second crop on the same pots the basic slag had a greater residual effect for both crops than did superphosphate. Superphosphate was significantly better than both rock phosphates when the crop was clover, but when the crop was wheat there was no difference in residual effect amongst the three types of fertilizer.

NITROGEN AND FALLOWING

The influence of length of fallow on yield of wheat grown on subterranean clover improved soils has been studied over four seasons.

A short (April) fallow period has produced yields as high as those from land prepared six months earlier.

A herbicide mixture (e.g. Diquat + Paraquat) used in the the autumn to prepare a seed bed gave grain yields equivalent to those from seed beds prepared by mechanical cultivation.

The concentration of mineral nitrogen available in the soil at sowing under short fallow was from 10 to 45 per cent lower than that released by the long fallow preparation. However, the addition of a nitrogen fertilizer did not significantly increase grain yields under these conditions.

In general the results indicate the possibilities of minimum cultivation and the use of non-residual herbicides in environments equal to or better than those at Wagga Wagga.

SOIL NITROGEN AND WHEAT YIELD

Evaluation of the relationships between wheat yield and the nitrogen extracted from the soil by different chemical techniques (e.g. mineral nitrogen, incubation nitrogen, acid soluble nitrogen, etc.) is now proceeding. Soil samples from the 0-4 inch and 4-12 inch depths have been collected from the 30 experimental sites located in the southern wheat belt.

Agricultural Research Station, Tamworth

GENERAL

Overseas Visit by Wheatbreeder.—Mr E. M. Matheson visited Mexico, the U.S.A., England and Rome to study methods of wheat breeding, with emphasis on maintenance of variety collections and improvement of durum wheats. His tour was financed by the Wheat Industry Research Council of Australia. The Council has also provided for a conference later, to consider establishment of an Australian collection of wheat varieties in light of information gained by Mr Matheson on the American World Wheat Collection.

WHEAT FROST RESISTANCE

Variety Testing.—Equipment and methods developed over the last four years were used in frost-resistance screening of more than 200 imported wheat varieties. Plants were grown in pots to the desired stage, pre-conditioned in a lighted cool room, and then frozen to closely controlled limits in a specially designed refrigerator.

A number of varieties introduced from Mexico were found to combine a very useful measure of cold tolerance with early maturity, good agronomic type and rust resistance.

They have been used in crosses with local wheats.

Testing for frost resistance has now been adopted as routine in the wheat breeding programme.

The Nature of Frost Injury.—Studies of ice development within tissues have led to a much better understanding of the nature of frost injury.

It is now clear that ability of certain cells in the nodes to restrict spread of ice is the major factor determining the fate of a wheat plant at sub-freezing temperatures. This factor varies throughout the year, and plays a part in natural hardening of plants in the field. Experiments have shown that it can even vary from day to day under the influence of appropriate treatments.

PLANT NUTRITION

Plant Nutrition Research Officer Appointed.—Mr I. C. R. Holford commenced duties in October, 1964. He has been surveying the plant nutrient problems of the northern wheat belt and parts of the northern tablelands. As a result he will concentrate on nutrition of leguminous plants, because of their status as pasture plants and also their role in nutrition of cereal crops and pasture grasses. The following three projects have been defined:

(1) *Contribution of Legumes to Wheat Soil Productivity in Northern N.S.W.*: The major aim is to determine the effects of varying periods of lucerne and cowpeas on soil nitrogen status and the yield and plant nitrogen status of succeeding wheat crops. The major long term experiment will be preceded by a uniformity trial on the experimental site, to determine the effect of measurable soil variables on wheat yield. A research grant from the Wheat Industry Research Committee of N.S.W. is supporting this work.

(2) *The Nutrition and Use of Lucerne as an Indicator of Wheat Soil Fertility Status*: The primary aim is to determine the relationship between the growth and nutrient concentration of lucerne and the growth, yield, and nutrient needs of subsequent wheat crops grown in the same soils. Because of practical problems involved in applying foliar diagnostic techniques to a short lived annual crop like wheat, the same technique will be applied to lucerne as to the other major component in the wheat rotation.

(3) *Nutrition of White Clover on the Granite Soils of the Northern Tablelands*: Studies already made by the University of Sydney and CSIRO have demonstrated the widespread deficiencies of both macro and micronutrients in these soils. This study aims to determine the initial and long term needs for phosphate and sulphur, the two nutrients most limiting to clover growth on the granite soils.

WHEAT BREEDING

The combination of near ideal seasonal conditions with minimum disease losses resulted in record yields of crops and plots throughout the north west.

YIELD TESTING

Advanced yield trial plots, sown at eleven sites throughout the northern wheat belt as well as on this Station, each provided valuable data.

Multi-line Varieties.—For the first time in the programme two multi-line varieties were tested, over a range of five sites. One multi-line was of local origin. The other was derived from the University of Sydney northern programme.

There were four constituents in each of these multi-lines. The results showed that for practical purposes more components are desirable. It was also obvious that the multi-line technique promises sufficient to warrant further investigation.

Local Material from Mexican Parentage.—This material was in the yield trials for the first time and showed promise. Many of the Mexican wheats in pure form appear to have wider adaptability and possibly better yield potential than the local commercial varieties.

DURUM WHEATS

Appointment of a Durum Breeder.—This appointment, made possible by a grant from the Wheat Industry Research Council, has added impetus to the programme.

The entire breeding project in recent years has concentrated on synthesis of semi-dwarf lines of Dural by back-crossing. In the past season increase and selection of lines containing two, three and four doses of the recurrent parent were made. Some of this material is promising in that grain colour, size and shape have been retained. Selected lines were submitted to the Bread Research Institute of Australia for preliminary quality assessment.

BREEDING FOR DISEASE RESISTANCE

Despite ever increasing complexity of the stem rust race flora there remains adequate material with resistance in all stages of the programme.

Widespread use of Canadian and Mexican lines as stem rust resistant parents is causing concern in the selection for flagsmut resistance, as generally these wheats are highly susceptible. Flagsmut incidence is increasing severely in commercial crops, particularly in the more northern areas.

As usual, all new breeding material was inoculated with flagsmut spores. The level of infection was satisfactory and allowed good progress in breeding for resistance.

INTRODUCTIONS

A very valuable parcel of early maturing Durum lines was obtained from Mexico. Further Durums were obtained from North Dakota and a collection of 30 bread wheats highly resistant to stem rust was derived from Canada.

CEREAL CHEMISTRY

Wheat Testing Laboratories Near to Completion.—These laboratories will comprise a mill room, bakery and analytical laboratory. A powerful air-conditioning unit for the mill room has heating, cooling and humidifying components designed to maintain the room at 21° (± 1°) and 70 per cent (± 2 per cent) relative humidity. All sample preparation, conditioning and milling will be carried out in this room.

A Brabender Quadrumat mill will be used in the early testing of both Durum and bread wheat varieties. Wheats at a later stage of the programme, and of which there are larger samples, will be milled on a pneumatic Buhler mill.

New varieties bred at the Station have until now been tested jointly at the Bread Research Institute and the Division of Science Services, Rydalmere, but all testing of the 1965-66 harvest will be done at Tamworth.

PASTURE RESEARCH

A macro-Kjeldahl unit for nitrogen determination has been installed in the main building and is working satisfactorily. All determinations to date have been done using Williams' technique of direct Nesslerisation of the sulphuric acid digest.

The pasture research programme both on and off the Station is concerned particularly with legumes, with emphasis on factors governing nodulation and nitrogen fixation in relation to forage yield. Potential of the naturalized *Rhizobium* population is being examined in relation to the popular legumes. Management studies on lucerne have been continued.

Growth of Clovers in Northern Tableland Granitic Soils.—The effects of the varied cultural, fertilizer and inoculation practices of the New England on the growth and productivity of clovers are being examined in a factorial trial commenced in 1965. The various sowing practices have been applied to seeds uninoculated or inoculated, with three inoculum strains. Plant growth, *Rhizobium* population development and soil nitrogen are being studied intensively over a two-year period.

Related laboratory and widespread field sites are concerned with clarification of the role of lime, as pelleting material and as a fertilizer.

These studies have been made possible by a grant from the Australian Cattle and Beef Research Committee.

Evaluation of Lucerne Strains and Varieties in Relation to Inoculation Treatment.—This study is of particular relevance to the north-west wheat area where Hunter River lucerne is the traditional legume sown. The major experiment, intiated in May, 1964, is co-operative with Dr A. H. Gibson, C.S.I.R.O., Canberra, and includes the Canberra Creeping and Canberra Hay varieties developed by Mr H. Daday, C.S.I.R.O., Canberra. Lucerne variety X *Rhizobium* strain interactions, already studied in the laboratory by Dr Gibson, are being re-examined in the field at the Research Station and in the New England granitic soil. The recent drought so far has restricted the data to spring samplings in 1964. Drought has also restricted samplings from an older trial. In this the previous superiority of Hairy Peruvian over a selection of Hunter River ecotypes is to be re-examined in the presence of N and P fertilizers.

Management of Hunter River Lucerne.—Early results of these studies, using cutting and grazing treatments, were published in the Agricultural Gazette, 1964. The studies have continued, with confirmatory results. They indicate that yield increases with reduced harvesting frequency and greater cutting intensity (i.e. leaving no stubble).

Effectiveness of N-fixation by Isolates from Local Soils.—The potential N-fixing ability of a larger number of *Rhizobium* isolates in the Tamworth region have been tested. Most have been from higher altitude sites where poor growth of clovers has been attributed to ineffective symbiosis.

More specific and intensive studies are planned to examine over the wheat growing area the effectiveness of naturalized rhizobia infecting lucerne. Similar investigations are proposed for the clovers on the non-arable soils bordering the wheat rhizobia country. In both these situations much seed is at present being sown without inoculation. It seems probable that productivity may be reduced by symbiosis with ineffective strains.

PHOTOPERIOD AND TEMPERATURE STUDIES—WHEAT

In a 1964 field study the developmental behaviour and timing of ear initiation and flowering of a number of spring wheats were examined. A group of varieties representing a range of development and maturity types were sown from March to October. Treatments also included vernalization, and artificially extended daylengths. Observations were made on the developmental behaviour and length of principal stages in the development of the varieties. These were related to daylength and temperature.

(*a*) *Response to photoperiod and temperature*: Increasing temperatures and lengthening days accelerated progress through all phases in the life cycle. The maturation phase, however, appeared not to be influenced by photoperiod. Furthermore, the reaction of the varieties in phase duration was quantitative. The requirements for completion of either the vegetative or jointing phase were described by the significant regression of the number of day degrees required to complete the phase against mean daylength.

(*b*) *Varietal differences*: From these regressions, some varieties were found to be relatively insensitive to daylength change in the vegetative phase. Others were highly sensitive. It also became apparent that, within varieties, sensitivity to changing daylength during their vegetative phases was not as important as the major differences between the varieties themselves. Temperature response in the vegetative phase exhibited a similar wide variation between varieties. The jointing stages of all varieties were quite sensitive to daylength. However, all varieties exhibited similar sensitivity. The ranking of varieties for earliness in this phase in response to daylength tended to remain the same over the range of daylengths used. Also, the response to photoperiod appeared to be the principal factor in separating the varieties. Temperature response in this phase also exhibited a similarity between varieties.

(*c*) *Leaf number and initiation*: Number of leaves produced on tillers was controlled by daylength. The degree of control depended on the sensitivity of the variety to photoperiod. Leaf initiation rate was related directly to mean temperature.

(*d*) *The environment*: Temperature environment at Tamworth during 1964 was low enough for field vernalization between mid May and late August, a period when screen temperatures were largely below 13°C. In Australia, natural photoperiod during the vegetative phase is as short as 11-12½ hours. This allows maximum differences between varieties to be expressed. Under these daylength conditions the daylength reaction of a variety is an important factor in its adaptation.

DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

State Marketing Bureau

MARKETING BOARDS

Functioning Boards.—The Egg, Rice, Wine Grapes and Lemon Marketing Boards constituted under the Marketing of Primary Products Act, 1927-64 continued to function.

With cessation of navy bean production in N.S.W. the affairs of the Navy Bean Marketing Board are being wound up. The French Bean Seed Marketing Board was dissolved this year.

Amendments to Acts and Regulations.—The Marketing of Primary Products Act, 1927-64 and several regulations under the Act were amended, and a number of new regulations were published.

Sustenance allowances payable to members of marketing boards were increased.

Regulation 12 of the General Regulations under the Marketing of Primary Products Act was amended by adding the definition of a producer of oranges for the purposes of any petition or poll under the Act.

New regulations were published covering the operations of the new Lemon Marketing Board and the payment of fees and allowances to members.

The Marketing of Primary Products Act, 1927-56 was amended by Act No. 47 of 1964 to make, *inter alia*, further provision for and with respect to the powers of marketing boards. As a result it became necessary to re-gazette Egg Board Regulations on the grading of eggs. An additional regulation to the Egg Marketing Board Regulations was also needed. It prescribed the Secretary, Egg Marketing Board for purposes of Sub-section 5 of Section 33 of the Marketing of Primary Products Act 1927-64.

Polls and Elections.—A number of polls were conducted under the Marketing of Primary Products Act, 1927-64. These included: the triennial election of producers' representatives to the Egg and Rice Marketing Boards; a poll on the question of the constitution of an Orange Marketing Board, which yielded a negative decision; a poll on the question of constituting a Tobacco Leaf Marketing Board, and the election of producers' representatives to this Board.

On receipt of a petition from broiler growers requesting that broilers be declared a commodity, preliminary action was taken towards conduct of a poll on whether or not a Broiler Marketing Board should be constituted for New South Wales.

MARKETING REPORTS AND RELATED SERVICES

The Division fulfilled its statutory functions relative to the Marketing of Primary Products Act, 1927-64, and continued to collect and disseminate detailed, wholesale markets information.

Market information officers prepared reports covering supplies, quality, prices and price movements at the City Municipal Markets (fruit, vegetables, poultry, fish and cut flowers), Homebush (cattle, sheep and pigs), Alexandria, Perry's Park and Sussex Street (grain, forage and hard vegetables).

Press and Radio Daily Service.—Information collated from the market officers' work was broadcast daily by the Australian Broadcasting Commission, including regional relays and interstate hookups. Some commercial radio stations also utilized parts of the marketing information prepared by the Division. The daily press, periodicals, Federal and State Government Departments and instrumentalities, producer organizations, etc., were furnished with detailed marketing information per medium of the Daily Whole Price Quotations.

Weekly Marketing Notes.—The Division continued to prepare and distribute its *Weekly Marketing Notes*. These, widely circulated, comprise detailed reports on the stock sales (sheep, cattle and pigs) at Homebush, prices and supplies of fruit, vegetables, cut flowers, forage, meat, fish, poultry, grain (local and overseas), miscellaneous farm produce and processed products.

Monthly, Price Trends Information.—The *Notes* also cover cold storage statistics of butter, cheese and fruit and include a series of average monthly prices, regularly prepared from Divisional records on a comprehensive range of farm products.

Monthly Surveys.—Monthly surveys covered stock feed prices on a wholesale and retail basis, and wholesale prices of dressed poultry.

Inter- and Intra-State Supply Trends.—Records of arrivals into Sydney by rail and sea of various primary products from interstate and intrastate sources were maintained.

General Information Service.—Numerous requests were received from State and Federal Government Departments, banks and private individuals (in Australia and overseas) for information about prices and prospective markets for an extensive range of primary products.

Crop Reviews and Forecasts.—This service was continued. Production forecasts were prepared for wheat, oats, citrus fruits and broom millet.

The regular monthly survey for and publication of *New South Wales Pastoral Conditions* and the *Report on Production Trends* continued.

Meteorological Services.—A Divisional Officer continued as Departmental representative in the State Climatological Committee of New South Wales and liaison officer between the Department and the Sydney Weather Bureau.

Comprehensive meteorological records and data are maintained in the Division. Meteorological advice and data were provided for officers of various Divisions of the Department and members of the public, particularly in relation to the effect of rainfall on various farm pursuits.

Economic Research

The Division's research programme continued despite the effect of resignations of senior staff and overseas study leave. Staff loss forced discontinuance of some projects but some important new projects were started. Several major projects were completed. Details follow:—

Economic Study of Cotton Production under Irrigation.—An economic study of cotton production under irrigation in south-western irrigation areas was completed. Most cotton growers in the area in 1963-64 were asked to record production details with a view to obtaining complete information concerning labour, tractor and picker requirements at different times of the year, as well as accurate details of the application of physical inputs such as seeds, fertilizers and sprays.

The information thus gleaned, together with that from interviews with three growers in 1962-63, enabled preparation of average total cost curves for growing cotton crops yielding in the range from 300 to 667 lb of lint per acre.

The main conclusion was that profitable cotton growing in south-western New South Wales, as a monoculture and at the ruling prices for the various grades of lint grown in 1963-64, would be unlikely in the absence of the Commonwealth Government's bounty, if yields were less than 500 lb lint per acre. With lint prices and the bounty steady at their present levels, yields of at least 300 lb of lint per acre would be required.

All economies associated with size seem to be exhausted at around 200 acres and the maximum that can be handled adequately by one man is 150 acres.

With current yields and revenue it would not pay to grow crops of less than 50 acres, and use of four-row equipment plus a grower-owned and operated picker has a distinct cost advantage over two-row equipment with contract picking under these circumstances.

For yields of 500 lb of lint per acre, and with the bounty, profitable cotton growing should be possible with a minimum of 15 acres, using two-row equipment and contract picking. Four-row equipment with a grower-owned and operated picker would be more economical for areas in excess of 30 acres.

For crops yielding 667 lb of lint the corresponding figures are 10 and 20 acres respectively.

A research article describing the study has been published in the *Review of Marketing and Agricultural Economics.*

Parametric Budgeting, Using a Model of the Sheep Enterprise.—A study of the important factors affecting economic return from sheep enterprises has been made and published in the *Review of Marketing and Agricultural Economics.* The factors considered were those that can be quantitatively measured. The important parameters considered were classified as (i) physical or biological parameters—for example: lambing rate, survival rate, longevity, wool production per head; and (ii) price parameters: i.e. the costs and prices of all inputs and outputs associated with the sheep enterprise.

To study how these parameters affect financial returns a theoretical model of the sheep enterprise was constructed. The enterprise was assumed to comprise a flock with constant size and composition from year to year. Flock size and composition were then defined in terms of the important physical, or biological parameters. Thus a physical model of the sheep flock was produced.

Having constructed a model which defined the block precisely in terms of the biological parameters, price parameters were then introduced to produce parametric budgets. Formulae were derived for total returns net of replacement costs per dry sheep equivalent. The remaining variable costs were deducted to determine the gross margin for the enterprise.

The gross margin can be used to determine the economic return from the enterprise. Thus, there is a method of studying how various factors affect the returns from the sheep enterprise; how various biological parameters affect returns given the prices, and vice-versa.

The published study also deals with some applications of the technique of parametric budgeting and the model approach. How a change in the value of a biological parameter brought about by changed husbandry practices could affect the gross margin for an enterprise is demonstrated. Using the same example, how a change in demand for young sheep could alter the relative profitability of the two alternatives is shown.

This technique could also be a guide for the biological research worker. He could assess in economic terms the value of a particular research result. It could also be a guide in deciding what particular line of research would produce the most profitable results for the farmer. This, of course, is only pertinent to "applied" research.

Given its limitations, this approach is useful for decision making on the farm. It can indicate what type of enterprise is likely to be most suitable under certain conditions. This is most useful when preparing farm development programmes and preliminary budgets. It indicates the likely profitabilities for certain enterprises and, being in the form of parametric budgets, the technique is flexible. Thus, one could consider various enterprises under different sets of conditions.

Economics of Sprinkler Irrigation on the Far North Coast.—This project was designed to define the role of sprinkler irrigation in the dairy farm programme on the north coast of New South Wales and to investigate alternative methods of achieving the same effect on farm production and income. It was completed this year. The results have been published in the *Review of Marketing and Agricultural Economics.*

The survey showed that on the far north coast spray irrigation on a part-farm basis is usually part of a management system involving also improved pastures and increased herd size. Of the 25 properties in the survey, an estimate of annual net gains due to irrigation and pasture improvement was possible in 15 cases. Substantial net gains were observed on five farms, but there were apparent losses on six farms. In the four other cases the outcome indicated that irrigation had been a doubtful proposition.

Alternatives in Handling Grain at Harvest.—A study to determine the least-cost method of handling grain from the header to the farm or railhead storage was made this year. The results have been published in the *Agricultural Gazette of N.S.W.*

Various methods are used in the operation. They range from bag handling to complete mechanization. The cost per bushel varies with each method, depending on the volume of grain handled, so average cost curves were constructed. These took account of overhead and variable costs. The basic information was obtained from selected farmers, machinery agents, officers of the Department and from general observations of harvesting operations.

The finding was that it is not profitable to handle wheat in sewn bags where more than 1,000 bushels have to be handled. For larger volumes the bag-to-bulk method is the least costly per bushel handled. However, for crops of more than 10,000 bushels the additional cost of using a bulk system amounts only to about 1d. per bushel. The cost advantage of the bag-to-bulk system is therefore relatively small on crops of more than about 300 acres with average yields of about 30 bushels per acre.

Costs of Operating and Owning Grain Headers.—A study of the costs of owning and operating grain headers was completed, and the results were published in the *Agricultural Gazette of N.S.W.*

The aim was to determine the overhead and variable costs of several different types of grain headers and at what acreage their costs break-even with those of a contractor. It is an important consideration. Outlay on a header is one of the largest single items of expenditure.

Five types of headers were analysed and overhead costs were based on their purchase prices, including freight. Variable costs were calculated, using data from the machine specifications and field observation. These were combined to derive average total cost curves. The contract rate was superimposed to ascertain the break-even points.

The main conclusion was that with a crop of less than 225 acres it is cheaper to employ a contractor at thirty shillings per acre than purchase and operate a 10 ft power-take-off grain header costing £1,460. This was the smallest header size considered. An 18-ft auto-header, costing £5,200, for areas in excess of 700 acres, a 15-ft auto, costing £3,890, for areas of 500 acres or more, and a 10-ft auto, costing £2,780, for areas in excess of 400 acres, would be economical.

Grain Storage Costs.—A study of comparative grain storage costs has been completed. The results will be published shortly. The cost of various temporary and permanent grain storage methods were compared. Temporary methods considered included bag storage, ground dumps and temporary bins. Permanent types examined were sewn bags, temporary bins in existing sheds, special grain sheds and steel silos.

Overhead and variable costs, obtained from manufacturers and by observation, were taken into account for all methods. Total storage costs were tabulated for a range of storage volumes. The comparative costs were presented in tabular form.

Of the temporary methods, bag storage appears least costly; at 4.48 pence per bushel where up to 2,000 bushels are to be stored. Thereafter, temporary Weldmesh R. Bins become cheaper. Their costs fall to 2.47 pence per bushel at 20,000 bushels. For more permanent storage, sewn bags in existing sheds have a cost advantage up to 2,000 bushels stored; the cost being 5.3 pence per bushel. For larger storages the erection of mesh bins in existing sheds is preferable; the cost falling from 4.2 pence at 5,000 bushels to 2.9 pence at 21,000 bushels. At this level of storage, grain sheds and steel silos are each more expensive, at 3.4 pence per bushel; but in practice these are probably more feasible methods, as building space would limit the placement of mesh bins in already existing sheds for crops of this volume.

Farm Management Study, Nowra District.—This study has proceeded for six years. It has now been discontinued. Not all of the original objectives were achieved but a lot of useful information has been obtained on costs, stocking rates and factors affecting net farm income, and other associated matters.

The data from the six-year period was originally intended for analysis to examine a range of problems. These included factors associated with financial success, farmers' adjustments to chronic low income situations, trends in capitalization, capital-output and capital labour ratios, sources of funds for new investment and trends in rates of return on investment. Not all of these objectives were fully achieved. But the work has clearly shown that the major profit-determining factors on the farms studied were size of property, number of cows milked, and milk yield per cow, in that order. It was apparent also that over 80 per cent of the variation in net farm income was due to differences in total level of milk production. Also, on the sixteen farms which participated throughout the entire six years of the study, gross output and net farm income moved sharply upwards despite a rising level of costs in the industry. Almost certainly the upward movement in net farm income has been substantially greater on these project farms than on dairy farms in the district generally.

The study has yielded a lot of information for farm management extension and experience in developing account analysis forms now being widely used in other areas.

Economic Study of the North Coast Dairy Industry.—Work on this project continued. It is investigating the economic aspects of adjustment alternatives for dairy farmers on the far north coast of New South Wales, to improve farm management extension and provide background information on policy matters affecting the dairying industry. Progress has been slower than anticipated. It is now expected that the project will be completed by early 1967.

Whole-Farm Studies: Far North Coast.—Good progress has been made. The primary objective is to improve the process and rate of farmer application of research results; guiding and studying the whole-farm application of new developments in farming systems. The project is designed (i) to ascertain whether research recommendations are satisfactory under practical farming conditions, (ii) to derive estimates of returns on capital invested and of the time taken for loans to be repaid, and (iii) to study physical and financial problems faced by farmers in applying recommendations. The whole of the work is being done co-operatively with Division of Plant Industry.

The study was extended this year and now incorporates seven farms. These include the three farms on red basalt soils where the work was commenced in 1962, two new farms on chocolate basalt soils and two new farms on alluvial soils. The last four studies were commenced at the start of the 1964-65 financial year.

Results to date are very promising but the project as a whole is a long term one. It will extend for about five years. Useful interim results are already in hand from the first group. the three red soil farms.

Economic Study of Large Area Farms on the M.I.A.—The optimum organization for large-area farms on the Murrumbidgee Irrigation Area under various assumptions relating to produce prices, resource supplies, input-output coefficients and production possibilities is now being investigated. Some of the more specific lines of investigation are:—

1. Determination of the minimum economic size of farms, using price and cost levels likely to be facing farmers in this area in the future.
2. Arriving at optimum farm programmes, using world parity prices for the main products (e.g. rice and cotton) and evaluating the income generated—by comparison with programmes based on ruling prices.
3. Testing the profitability of programmes, using realistic water charges, based on inclusion of an amount providing for write off of the capital debt on storage and reticulation structures erected by the Government to establish and maintain the area. (Water charges do not at present include any allowance for amortization of the capital debt. They cover only the annual costs of maintaining the structures.)

This study will apply linear programming, with its many variations such as variable price and resource programming; and quadratic programming to take account of the farmers' risk aversion factors.

Coleambally Economic Study.—This long-term project, referred to in earlier Reports, has continued. The aim is to study the economic aspects of large-area irrigation farm development including:—

(*a*) rate and extent of capital accumulation:

(*b*) cost of farm development;

(*c*) rate of development in relation to initial capital resources;

(*d*) range of incomes earned during the development stage;

(*e*) profitability of alternative farm enterprises;

(*f*) determination of optimum farm size.

The financial and physical records of twenty-two large-area farms have been kept since the date of occupation by each settler; since early 1960 in eight cases, four since early 1961, and since mid-1962 for the remaining ten.

Supplementing this study, a further study will be started, to determine optimum development patterns on these farms with the aid of linear programming. The procedure will be similar to that outlined for the study of large-area farms on the M.I.A., except that a random survey will not be done. There is sufficient information available from the twenty-two co-operating farmers for preparation of matrices. This will take at least twelve months to complete.

Linear Programming Studies.—Linear programming studies have such potential in farm management analysis that some experimental work in use of this technique is being done.

The several experimental studies in progress include one involving study of farm organization problems of Hunter Valley dairy farms and another involving study of farm management problems for farms in an area east of Wagga. The technique will be used, also, in several other investigational programmes now being developed by the Division. Some of these are referred to elsewhere in this report.

This year the suitability of Honeywell programmes LPINPT and LPP4A for linear programming of agricultural problems was tested. The programmes proved satisfactory for their purpose, but there being no parametric facilities as yet available for the computer this will be a limiting factor in some linear programming studies.

Economic Study of the Pome Fruit Industry.—The work has been delayed and is unlikely to finish before the end of 1965. The main objective is a general description of the structure of the pome fruit industry, to identify industry problems and provide basic information for advisory work and further research.

Hawkesbury Area Vegetable Industry.—At the request of a vegetable growers' organization, management and organizational problems of vegetable growers in the Hawkesbury Valley area are to be studied. At the same time opportunity will be taken to obtain basic input/output data for the vegetable industry.

A number of growers in the Hawkesbury Valley will keep detailed records of their farm operations. As suitable data is obtained the budgeting and/or the linear programming technique will be used to devise profitable farm programmes for the area. This is a long-term project and will extend over several years.

Economic Assessment of Flood Mitigation Work—Hunter Valley.—Economic benefits arising from flood-mitigation works in the Hinton-Swan Reach area in the Lower Hunter Valley are being assessed. Properties affected by the work have been field-surveyed. A benefit-cost study will be based on the data collected.

Cost-Benefit Analysis of Border River Irrigation Proposal.—At the request of Department of Conservation the irrigation potential from proposed erection of a dam at Pikes Creek (Queensland)is being assessed. If this dam were erected the water would be shared equally by N.S.W. and Queensland. It would provide irrigation in the Dumaresq River Valley. The present study is designed to evaluate the likely benefit to N.S.W.

A field survey of a sample of affected properties commenced in June. A report will be available before the end of 1965.

Production and Marketing of Honey in N.S.W.—Work continued on this general topic, referred to in earlier reports. The investigation of costs and returns referred to in last year's report has been completed. Capital investment and returns on capital in the beekeeping industry have also been studied. The results will be published.

The project is continuing, with investigation of possible economies of scale in beekeeping, a study of the influence of prices and methods of sale on beekeepers' incomes, an attempt to derive iso-return on capital curves for different apiary sizes, and an economic analysis of beekeeping statistics in N.S.W. for the ten-year period ended 1963-64. An economic study of production of honey from different flora is also in progress.

Bibliography of Agricultural Economics.—The authors have completed their compilation and sufficient finance has been provided by various organizations to ensure that the bibliography is published.

Poultry Management Study in the Sydney Area.—This study, referred to in earlier reports, was started by the Commonwealth Bureau of Agricultural Economics in 1957 and taken over by this Department in 1962. The main purpose has been to investigate the economic and physical basis of successful poultry farming and establish comparative standards to aid extension work in poultry farm management.

Reports covering detailed activities of farms included in the study have been prepared for each year until 1963-64. The latter will be presented in a combined report covering 1964-65 also.

This study seems to have reached a point where it will not provide sufficient useful new data to justify continuance. It will end with the 1964-65 season. But replacement by a more rigorous investigation, to provide far more useful data for management purposes than has been available from the earlier study, is under consideration.

Economics of Wheat Segregation and Wheat Storage.—Two projects are to be conducted with funds from the Wheat Industry Research Council. The main one is to provide an assessment of the economic benefits and costs, and the effect on the structure of the wheat market, of a proposal to segregate New South Wales wheat into hard and soft classes. This project will attempt to establish whether grading wheat in New South Wales will benefit the wheat industry financially, after this market innovation has had its full economic impact on the wheat market—domestic and international.

The grading system to be considered is that suggested by the Department's Chemistry Branch as technically and administratively feasible; segregation of all wheat delivered at country receiving points into the following quality classes:—

(*a*) Hard Wheat.

(*b*) "F.A.Q."—similar quality to the present F.A.Q. sample but exhibiting greater homogeneity.

(*c*) Soft Wheat.

This grading system will only apply to the present F.A.Q. sample. The system of premium hard and premium soft wheat will be retained.

A major difficulty for this project is the absence of any satisfactory theory on which to base an objective analysis (least of all a cost-benefit appraisal) of a decision to grade a product which is traded in a market characterized by oligopolistic activities. Oligopolistic features of the wheat market include small numbers of sellers and buyers and various forms of non-price competition. So far this methodological barrier has not been solved, but various possible solutions are being studied.

Meantime a related study ("An Economic Analysis of Wheat Storage in New South Wales") is being undertaken. Its objects are determination and analysis of the relationships of the more important variables that bear on the costs and relative advantages and disadvantages of different wheat storage media; and to provide for the New South Wales wheat industry estimates of the real costs, capital and annual, of alternative forms and locations of wheat storage facilities, viz.:—

(*a*) On-farm storage—temporary and permanent.

(*b*) Local silo structures, i.e., storage structures located at rail sidings in the wheat belt—

(i) vertical structures,

(ii) horizontal structures, and

(iii) temporary storage.

(c) Sub-terminal storage, and

(d) Terminal storage.

A least-cost storage and transport policy for the industry in respect of the amount, location and form of storage, under the assumption that all grain produced in any one year is consumed before the next harvest begins, is desired.

A questionnaire for distribution to a large sample of wheat growers has been prepared and will be despatched early in the new financial year. Provided the questionnaire yields the information required from wheat farmers, the project could be completed by mid-1966.

Economic Survey of Beef Cattle Production.—This project was referred to in last years' Report. It has been completely re-organised.

A detailed economic survey of beef cattle production in north-eastern New South Wales is now being undertaken. This is to provide a background of management practices and resource potential; a basis for more intensive studies of a whole range of economic problems facing beef production in that area. It is the State's most important beef cattle region. The work is financed by the Australian Cattle and Beef Research Committee.

The officer engaged will eventually be stationed permanently at Grafton Agricultural Research Station and in close liaison with other research personnel there. Meantime he is located at the University of New England where the work is being supervised by the Professor of Farm Management in collaboration with this Department.

Farm Management Accounting.—An experimental project has been started in the Western Agricultural Region. It is to interest practising accountants in modern farm management accounting procedures and actively assist those who wish to implement such procedures on behalf of clients. Help has already been given to accountants at Wellington and Mudgee, through design of appropriate recording systems and advice on farm management accounting procedures.

This pilot arrangement envisages that farmers participating will provide a property description, detailed opening and closing stock takes and will keep a daily farm activity record; these will be analysed by the participating accountants, in the form prescribed. The results will be appraised by the regional Economics Research Officer and other Departmental officers. The latter may subsequently, where requested, make technical recommendations to individual farmers participating.

The co-operation thus engendered between farmers, accountants and Departmental officers will provide much useful data for farm management purposes.

Stocking Rates in Southern New South Wales Marginal Wheat Areas.—A project to evaluate the economic feasibility of improving dry-area pastures and increasing stocking rates in the marginal wheat areas in southern New South Wales is now proceeding.

To obtain more accurate information on relationship between stocking rate, wool yield and supplementary feeding costs, 75 questionnaires have been sent to graziers in the dry areas around Leeton and Narrandera. The graziers were selected at random from the total population. To date, 35 replies have been received and 15 of these supplied sufficient information for an analysis. This project could be completed by the end of 1965.

Sheep and Beef Cattle Grazing Relationships.—A project to examine and quantify the stocking rates of sheep and beef cattle on different pastures at different times of the year has been started in the Molong Pastures Protection Board District. The study is based on a 20 per cent sample of all properties, in B Division of that District, which showed 20 or more cattle in the rating statistics for December 1963. All property owners in the sample will be asked to keep a daily record of movements between paddocks. Subsequently an attempt will be made to relate stocking rates to costs and returns, to determine optimum stocking rates and to investigate the possible existence of complementary, supplementary and competitive grazing relationships.

Optimum Farm Programmes for the Berriquin Irrigation District.—A project to determine optimum farm programmes in the Berriquin Irrigation District has been initiated. In this project the effect of the ratio of irrigated land to dry land on several different types of farms will be studied.

Initially, randomly selected farms in the southern irrigation districts, some nearby private pumping schemes and surrounding dry land farms will be surveyed. This should give information about present farming conditions and patterns on many types of farms in the Murray area, and indicate the particular features needing closer examination.

Subsequently data will be collected from several farms of each type in the Berriquin Irrigation District and a linear programme will be set up. This is a relatively long term project; unlikely to finish in less than two years.

Study of Private Co-operative Irrigation Scheme.—A private irrigation scheme in the south-west known as the Moira Private Co-operative Irrigation Scheme is about to be studied, to compare progress there with results of farmers in the Coleambally Irrigation Area.

Eventually a benefit-cost analysis of the scheme will be done, and the study may also yield useful information on the question of the optimum ratio of irrigated land to dry land.

This study requires records to be kept over a period of years and is likely to take five years to complete.

Economics of Fodder Conservation Using Forage Harvesters.—A relatively small project is in hand, to study the costs involved in cutting fodder using forage harvesters and subsequently feeding it out to sheep and cattle.

A series of cost studies has been made to determine the costs of operating forage harvesters and the cost of collecting and transporting fodder in trailers or tip trucks under farm conditions. Costs of feeding out the fodder as green chop have also been determined. Returns from feeding sheep and cattle with green chop will now be examined, partly by using case studies and partly on the basis of livestock research officers' experience. This is necessary because of the small number of farmers actually engaged on this type of feeding. The project should be complete before the end of 1965.

Costs of Harvesting Irrigated Crops.—Comparison of the cost of employing contractors to harvest crops grown under irrigation in south-western New South Wales with costs involved when the farmer owns and operates his own machinery is proceeding.

Research Projects Suspended or Discontinued.—A number of research projects referred to in past Reports were discontinued or suspended this year, without having reached finality. In each case the decision was due either to staff resignations or staff leave of a protracted nature.

Projects discontinued included a dairy investment study, a study of the economics of serrated tussock control, a study of establishment problems in farming, and an investigation of the economics of fertilizer usage. Each, except for the dairy investment study, may be resumed when the staff position permits.

Advisory, Educational and Extension Activities

Farm Management Extension Services.—Owing to staffing problems, no significant development of the farm management advisory service referred to in earlier Reports was possible. However, a number of inexperienced but well qualified graduates have been recruited and are being trained for subsequent appointment to Regional positions.

The programme of in-service training in farm management for technical extension and research personnel of the Department has been continued. Schools and courses in farm management for the farming community have also been continued. But the number of such schools and courses declined this year, owing to lack of experienced staff.

Policy Advice.—The Division continued to provide advice on economic policy affecting agriculture. It also continued to examine and advise on the position concerning imports and exports of coarse grains, protein concentrates and other farm requisites.

Quarterly Journal.—The Division continued to publish its quarterly journal the *Review of Marketing and Agricultural Economics*. A high standard has been maintained. Papers from agricultural economists employed in other organizations are accepted for publication in this journal. In particular, The University of New England Faculty of Agricultural Economics has submitted numerous papers.

Lectures at Extension Schools, etc.—Besides organising the farm management schools already referred to, officers of the Division addressed several schools organised by the Agricultural Bureau, Universities and other organisations. Officers also addressed various professional societies and other organisations on economic aspects of the rural industries.

Lecture Courses at Agricultural Colleges.—The Division now has a full-time lecturer in farm management at Wagga Agricultural College. This lecturer also provides a course in farm management economics in the recently established Farm Certificate Course conducted at Yanco Agricultural College.

Lectures at University of New South Wales.—Two officers of the Division have given short, part-time courses in aspects of farm economics to students in the School of Wool Technology at the University of New South Wales.

Representation on Committees

Divisional officers continued to act as Departmental representatives in the State Nutrition Committee, the Markets Advisory Committee, Gwydir Valley Investigational Committee and the North Coast Economics Research Committee.

The Chief of the Division acted as New South Wales member of the Interim Committee on Tobacco Stabilization under Commonwealth legislation. The Division also provided the Chairman of the Yass Valley Project Technical Committee, and another member of the economics research staff is also a member.

The Principal Economics Research Officer was a Ministerial nominee on the Rice Marketing Board but resigned from this position in April, 1965, owing to pressure of Divisional work. Towards the end of the financial year a member of the economics research staff was appointed secretary of the Cabinet Sub-committee on Drought Relief and secretary of the Inter-Departmental Standing Committee on Drought Relief.

For the early part of the year the Chief of the Division continued his term as President of the New South Wales Branch of the Australian Agricultural Economics Society. The Principal Economics Research Officer, a Federal Vice-President in the early part of the year, was elected Federal President of the Society in 1965. The Principal Economics Research Officer was invited to join the interim organising committee for the International Conference of Agricultural Economists to be held in Sydney in August, 1967.

DIVISION OF INFORMATION SERVICES

Scope

The Division engaged in:—editing, re-writing, writing for publication; research liaison in terms of advice and writing assistance to research workers preparing matter for science journals; agricultural library services for the Department in general; information and publications' distribution in response to 'phoned, postal and in-person inquiries; assessment and acquisition of audio and visual aids equipment for extension workers; development of extension workers' skills in using aids, including radio and television; tape recording service for field officers' radio sessions; cine filming for field officers' television sessions; cine film library services; preparation of show exhibits and graphics for extension uses; organisational help to the Agricultural Bureau, and promotion of group extension activities through this and other rural groups; organisation, and tutorial staffing of short schools and courses for rural people and Departmental officers; information and extension services for rural women; extension service/methods training and examination of field officers and university undergraduates in rural Faculties.

Reading and Study Skills Training

Six x 2 hour sessions for improvement of reading and study skills was an innovation at the 1965 Extension Service/Methods School. Acquisition of the training equipment was mentioned in last year's Report. The sessions, intended to show field officers that notable improvement could be affected in these areas by personal effort, had the desired effect.

Editing Section

The Miscellaneous Literature.—The number of titles is now 1,190, 25 per cent more than it was 10 years ago. This year the number of jobs sent to the printery was 320, compared with 287 in the previous year and an average of 181 per year for the preceding 10 years. Notwithstanding the record of 320 jobs to the printery there is a backlog of 239 requiring attention before reprinting, compared to 240 a year ago. The backlog of 239 includes a high percentage of hardcore, difficult assignments. The record of 320 to the printery was achieved in part by sacrificing quality of attention, under pressure by the volume of work facing the staff. In part it was due also to the big increase in number of brochures or programmes concerned with short schools/courses/conventions and similar promotions.

The Printer delivered 309 publications, compared with 216 in the previous year. The 309 included reprints from 18 issues of the Gazette, since the Printer this year overtook most of the longstanding backlog in reprints. At 31st June, 1965, there were 140 jobs still at the printery, compared with 124 twelve months earlier.

Roneoed, Press Releases.—These increased to 63, compared with 50 in 1963-64 and 27 in 1962-63.

Weekly, Press Copy.—Publication of this broadsheet, suspended on 27th March, 1964, was resumed on 5th February, 1965. The 19 issues since this date comprised 195 items. Circulation totals 1,054 addressees.

Bi-monthly, Dairy Topics.—Seven issues have been delivered and two more are at the printery. This total of nine prepared compares with three in the preceding year when editing staff was at half strength and "copy" was, in any case, not flowing readily from authors. This year's work has overtaken the backlog of three issues, incurred in the previous 12 months.

Quarterly, Poultry Notes.—Four issues have been delivered, leaving this quarterly one issue in arrears; as was the case a year ago. Slow flow of copy from the author Division explains the inability to overtake the backlog.

Monthly, Agricultural Gazette.—Twelve issues were delivered and nine of these were received in the nominal month of issue. Only the January, 1965, issue was very late, appearing on 15th February. The two other late issues were only two to three days into the wrong month.

Reduction of the mailing list from 36,790 to 16,232 addresses has helped the Printer's delivery schedule. It also enabled the Printer to resume a former block-reproduction procedure, to restore quality that had been lacking from November, 1963, until February, 1965.

Provision of reprints from the Gazette has been speeded up. This year the Printer delivered reprints from 18 issues of the Gazette. Now almost all reprints are in delivery within three months of Gazette publication.

The Research Section of the Gazette averaged 10 pages per issue, including an average of five pages of research pars. Format of the Section was re-designed, to a 3-column style, to differentiate it.

A new feature of the Farm Home Section is "Country Cooking" and yet another is "Try This One" (household hints). These features were started in the May, 1965, issue.

Flow of contributions to the Gazette improved notably this year. Since October, 1964, each issue has been filled by contributed matter. The reasons are appreciated and have been recorded elsewhere.

New, Bi-annual "Veterinary Notes".—The first issue of this new periodical is at the printery. It is a 36 pp. publication with format similar to that of the Gazette. Division of Animal Industry instigated it, as a service to Departmental and Pastures Protection Board veterinary officers and practicing rural veterinarians.

Regional Series "Research and the Farmer".—Work proceeded on two more issues, and one mentioned in the previous year's report. These three issues comprised No. 2 (for Southern Region), delivered on 2nd March, 1965 ("copy" to the printery on 10th July, 1964); No. 3 (for Far North Coast) and No. 4 (for South Western Region). Nos 3 and 4 are almost ready for the printery.

"Weeds" Book—2nd Edition.—The compiler, Mr J. N. Whittet, is preparing the 2nd Edition under contract and responsible to Division of Plant Industry. Stocks of the 1st Edition (6,500 copies, 42s. per copy) were exhausted in September, 1964.

"Pastures" Book—1st Edition.—The 1st Edition, comprising 7,000 copies, 42s. per copy, became available in July, 1964. Within this first 12 months, some 3,280 copies have been dispersed—including only 36 complimentaries.

Research Liaison (Science Writings) Service

The research liaison officer is required to pursue reader research into science writings, publications, reports; to be familiar with Departmental research workers' projects; and to rewrite, write-up or assist the writing-up of matter in a form suited to particular journals. Amongst his specific duties is maintenance of a Research Section in the monthly *Agricultural Gazette.*

Sixty-one "research pars" were published this year in the Gazette's Research Section, providing a 25 per cent increase on the per month rate achieved in 1963-64 for the first six months of this feature Section. Also, the Research Section included a science paper each month this year. The intention has been to publish not more than one per month in the Gazette.

More time and effort than the research liaison officer could afford was devoted to organisation and editing of a Far North Coast issue in the "Research and the Farmer" series. The experience was valued and helped to show that similar service to other Regions will be beyond the resources of this Division unless more "science writer" appointments occur.

The research liaison officer studied and supplied comment on 38 draft papers by science authors within the Department. Major analysis and part re-writing to demonstrate style was needed in most cases.

Nine research stations/institutions of the Department were visited by the officer, some more than once; to collect matter for Gazette "research pars", to investigate potential authors' readiness for publication of research projects and/or to discuss draft papers with authors.

Considerable demand, far beyond his capacity to handle, has been withheld from his attention by research workers until such time as further appointments may be made in this section.

Meantime, pending issues of the *Australian Journal of Experimental Agriculture and Animal Husbandry* are about to reveal a notable increase in volume of papers from this Department's research workers, in part the result of his help.

Enquiry Section

Excluding the Home Gardens Advisory Officer's work (see later heading) the enquiry counter office-assistants handled 41,458 requests for service, compared with 43,741 in 1963-64 and 45,552 in 1962-63. Thus the policy first mentioned in the 1961-62 report, of steering rural enquiries towards the Department's country offices seems to have consolidated its effect.

Of the 41,458 requests in 1964-65:—8,033 were telephoned, compared with 7,986 in 1963-64; 15,502 were postal, compared with 14,449 in 1963-64, 17,116 in 1962-63 and 20,788 in 1961-62; and 17,923 were in-person, compared with 21,306 in 1963-64.

Of special interest is the reversal of metropolitan—rural proportions in this year's *postal enquiries*:—11,413 from metropolitan and 4,089 from rural addresses, compared with 3,967 from metropolitan and 10,482 from rural addresses in the preceding year.

Publications Distribution

In response to the requests for service noted in preceding paragraphs, the enquiry counter office-assistants distributed 860,128 publications, compared with 591,139 in 1963-64 and 843,790 in 1962-63. The 1963-64 total was reported last year as unusually low, because many publications came from the printery at too late a stage of 1963-64 for distribution.

The 860,128 distributed in 1964-65 were spread over 1,190 titles; and comprised 704,790 despatched in bulk parcels to country offices, and 155,338 distributed direct to members of the public requesting service. The 704,790 in bulk to country offices is the biggest total so far dispersed in that way.

Sales of Publications

"Pastures" Book Sales.—Since the 7,000 copies 1st Edition of this 632 pp. book became available in July, 1964, some 3,280 copies have been dispersed. Only 36 were complimentary, including some for review by appropriate journals here and in other countries. But a considerable number were sold at discounts ranging from 10 per cent to 33 per cent of the 42s. retail price. The discount sales were to bookshops, libraries, and institutions or student groups purchasing in bulk. The progress revenue at 30th June, 1965 totalled £5,070.

Miscellaneous Sales Publications.—Progress revenue from sales other than the "Pastures" book totalled £841 at 30th June, 1965, comparable to the £862 totalled a year earlier.

Home Gardens Advisory Service

Individual Contacts.—Dealing with home garden, allied, and commercial floriculturalist enquiries of such type that the enquiry counter office-assistants could not service by resort to the literature range, the home gardens advisory officer handled 6,432 enquiries—compared to 6,352 in 1963-64, 6,544 in 1962-63 and 6,455 in 1961-62.

Of the 6,432:—1,864 were in-person enquiries, 1,203 were postal and 3,365 were by telephone. The proportions were similar in the preceding years.

Mass Media.—This adviser also produced articles for the *Agricultural Gazette*—one on lawns and one on cyclemen culture—and others for weekly *Press Copy.* He prepared also the "copy" for a new booklet on "Lawns" in the miscellaneous literature series. This has yet to be processed for despatch to the printery.

Library Services

Staff Responsibilities Increased.—Librarian-in-charge Mr J. Hazell has been appointed as from 10th August, 1964, to the position of Librarian, State Office Block. Pending occupation of the Block by several Departments, including Agriculture, he has had a substantial increase of work—in preliminary organisation for the drawing together of the several libraries concerned. Meantime another librarian has been added to his establishment to assist the survey of these libraries.

Branch Libraries.—Full-time librarian service was provided at Hawkesbury Agricultural College, the Royal Botanic Gardens and National Herbarium, the Division of Science Services at Rydalmere, jointly the Division of Animal Industry and Glenfield Veterinary Research Station, and jointly Wagga Agricultural College and Agricultural Research Institute. Part-time service continued in the Divisions of Dairying, Horticulture, and Marketing and Agricultural Economics. At Rydalmere, where demands have greatly increased, a supernumerary clerk is assisting the librarian three days a week. Regular staff meetings of the branch librarians were held.

Accommodation extensions are being effected at Hawkesbury College. Arrangements have been planned for proposed accommodation of the Horticulture and Plant Industry Division's branch libraries at Rydalmere. Proposals for accommodation extensions at Wagga College and Agricultural Research Institute are in hand.

Purchase of books and periodicals for some of the larger Research Stations was heavy this year.

Ordering and Accessions.—The central library placed on order 1,296 items, through the Agent General in London or local booksellers; compared with 1,071 in 1963-64. Of the 1,296 items:—957, including 78 periodical titles, were for the central library, branch libraries or country offices; 131 items, including 3 periodical titles were specifically for Hawkesbury College; and 208, including 7 periodical titles, were for Wagga Agricultural College.

Accessions totalled 21,993 items, compared with 16,778 in 1963-64 and 17,585 in 1962-63. The 21,993 comprised 652 books, 9,729 issues of periodicals, 10,670 pamphlets (10,064 in series, 379 catalogued, and 227 distributed and/or arranged by subject), and 942 annuals (37 bound and 905 unbound volumes). Also, 381 volumes of unbound periodicals were assembled and tied preparatory to requisitions on the Government Printer for bindings.

The increase of library accessions was partly the outcome of concerted effort to secure bulletins and reports of various Agricultural Experiment Stations and Departments of Agriculture not previously received. Many outstanding items were secured.

Funds.—The Central Administration vote for books, periodicals and newspapers increased to £5,500. Standing commitments for periodicals now well exceed £4,000 per annum and it has been necessary to request a substantial increase in the 1965-66 allocation.

Of the 1,296 items placed on order in 1964-65, some 94 books were purchased with Commonwealth Extension Grant funds—making a total of 2,142 books in reference collections at 84 country offices. For the Hawkesbury and Wagga Agricultural College purchases mentioned in an earlier paragraph, special Trust Accounts founded by the Colleges were used.

Central Library Loans.—Some 33,650 items were loaned, compared with 31,240 in 1963-64 and 29,659 in 1962-63. Of the 33,650 items:—27,307 (an average of 525 per week) were periodicals circulated, and 6,343 (an average of 122 per week) were miscellaneous loans; 5,170 of the 6,343 were to officers of the Department, 951 were to other libraries, and 222 were borrowed from other libraries for loans to Departmental offices.

Figures for branch library loans are not included here but are considerable.

Library Information Bulletins.—Twelve bulletins were compiled and distributed to head office and country officers, institutional and district. The bulletins totalled 258 pages and listed 2,769 classified items, compared to 262 pages and 2,703 classified items in 1963-64.

Reference Work and Literature Searches.—The librarians continued to undertake reference work and literature searches for Departmental officers, external institutions and members of the public. The reference lists produced by the searches were listed in subsequent Library Information Bulletins for possible value to other officers.

Photo-copying Service.—The service handled 660 jobs, involving 5,462 sheets; compared with 554 jobs and 5,625 sheets in 1963-64. Public Works Department's service was used occasionally. Education Department's Xerox machine was used for the bulk of the work.

Audio and Visual Aids Sections

TELEVISION TRAINING, USING CLOSED CIRCUIT TELEVISION

The Division's extension officers specialising in audio/visual aids conducted television-training sessions at the Department's Extension Service/Methods School in January, 1965; also a three days TV Training School at Gunnedah for north western field officers. In consequence they are now committed to similar assignments in other Regions in 1965-66. Their Closed Circuit Television Unit now comprises *two* cameras and four monitors. The second camera was acquired with Commonwealth Extension Grant funds this year.

PHOTOGRAPHIC AIDS SECTION

Tutorial Services.—The extension officer (photographic and allied aids) provided training sessions on photography, television preparations, and overhead projector usage at in-service schools at Hawkesbury College and Gunnedah. The Division's Closed Circuit Television Unit was used in the TV training sessions. He also provided a tutorial on overhead projector usage, and the associated transparency-maker machine, in each Region whilst delivering these items of equipment. A tutorial session on "photography in extension" was provided for the veterinary inspectors' conference. A tutorial session on overhead projector usage was given for instructors of psychiatric nurses, Department of Health.

Field Officers' Photography.—A total of 19,180 photographs by field officers, compared with 23,152 in 1963-64, passed through the Photographic Aids Section in two directions—to the 35 mm contract processors *via* the Government Printer, and back to the field officers in due course. The products returned to field officers are transparencies, for projection in extension work.

The 19,180 shots comprised 11,080 in colour—a slight increase on 1963-64, and 8,100 black and white—a big reduction on the 13,032 black and whites in 1963-64. This big reduction has been assessed as indicating that the abnormal activity on black and whites in 1963-64 yielded, for the present, adequate collections. Further experience has shown field officers that black and whites are not *essential* for television segments.

Special Purpose Photographic Work.—Reprints made this year totalled 3,218, compared with 1,350 in 1963-64, and 2,400 were produced in the Division's darkroom.

Amongst prints produced in the Division were three mural-sized enlargements for the Royal Show rice industry display, two television series of diapositives on cotton industry, a television series on cheese and butter making, and two captioned colour series for automatic projection in show exhibits.

Ninety-seven camera assignments demanding special skills were fulfilled. Most of these were of small specimens but some were portrait sittings, and one assignment alone comprised 30 photographs of individual trees whilst another comprised a series on the Honeywell Computer.

One rural itinerary involved cine filming of six lines of subject matter for country officers' television usages. Each subject resulted in an approximate three-minute film footage.

Cine Film Library Service

Film Acquisitions.—Ten new prints were acquired.

Film Loans.—The remarkable decline in film borrowings continued, apparent since the advent of rural television channels. From 884 programmes collated in 1961-62, involving 1,913 films, the total has declined to 262 programmes in 1964-65 involving only 558 films. Moreover, a high proportion of the 1964-65 programmes actually comprised films sought by country officers for assessment of their possible value in television segments and several more were for use in short schools or courses organised for farmers by this Division or Regional officers.

Radio Section

Tutorial Services.—The extension officer (radio) did itineraries amongst field officers in five Regions; for advice on tape recording gear, radio speaking, interview methods, subject organisation and scripting, use of Public Address systems, cine film projectors, and organisation and scripting for television segments. He teamed also with the photographic aids extension officer for television training sessions at in-service schools.

Tape Recordings for Rural Radio.—Only three of the 45 rural stations do not have a regular farm programme comprising Department of Agriculture material, taped or otherwise, provided by field officers. From Regional reports it would seem that 1964-65 broadcasts increased from about 4,000 to about 6,000—but with pattern changes involving more frequent, and shorter, broadcasts.

Tapes from the Division, to assist country officers' programmes, totalled 130; compared with 148 in 1963-64. Of the 130:—19 were recordings by head office specialists and 111 were by women's service officers. Of the 111 from the women's service, 73 were publicity messages about pending schools and courses.

Tape Recordings for Personnel Training.—Lectures by head office personnel to junior clerks preparing for Reg. 116 examinations were tape recorded and replicated for despatch to junior clerks in country offices.

Equipment Developments.—Requisitioning and overall supervision of matters concerned with all audio equipment, including cine film projectors and some other visual aids, continued expediently as responsibilities of the extension officer (radio).

Major acquisitions included:—ten more transistorised tape recorders, with microphones, power pack adaptors and line adaptors for country officers' use in field interviews for radio; ten low impedance P.A. microphones for use with portable 10 watt amplifiers; a second television camera for the CCTV unit, to facilitate the incorporation of 35 mm slides and 16 mm cine film clips in the television training sessions; a special tape recorder with pilot tone facilities for field recordings, synchronised with 16 mm cine film footage; and a special microphone, synchroniser and power pack for studio sound dubbing.

Display Artist/Designing Service

Show Displays.—A normal volume of assistance was given, in the form of signs, charts, maps, ticket-writing, to field officers involved in country show displays.

The 1964 Royal Show display ("Cotton Industry") was adapted for further use at and assembled for displays at Forbes, Leeton and Griffith. The 1965 Royal Show display ("Rice Industry") was designed, prepared and assembled, with co-operation from appropriate other sections of the Department.

Lecture Aids.—Near to 500 aids (maps, diagrams, charts, signs and tickets) on card or linen were produced for various Divisions.

Publications' Layout/Design.—Cover designs and finished art were supplied for booklets and other publications referred to the section by editing staff. Near to 100 photographs were retouched for block "copy".

Agricultural Bureau Activities

Statistical.—Eight new branches formed; two branches disbanded; 140 branches affiliated financially with the State Advisory Council, 19 fewer than in 1963-64; the State Advisory Council met on four occasions and comprised 14 male and two female councillors plus the State President and Past President; attendance average of councillors was 78 per cent of the possible maximum; the 40th State Congress, three days of educational sessions at Hawkesbury College, drew a residential attendance of 200—the best for several years; eight major conventions/major field days were held under Regional/Divisional/District sponsorship—with attendances ranging from 70 to 270; most of the 140 affiliated, reporting branches held one or more local field days as well as branch meetings for lectures, discussions and allied extension purposes; many of the branches sponsored short schools or courses—reported in next paragraph.

Short Schools/Courses Sponsored by Agricultural Bureau.—Demand for schools and courses on a wide range of agricultural and home economics subjects was strong and could not be met in full.

Three *Leadership Training Schools* (three days each) were held—at Condobolin, Dubbo and Coff's Harbour. A five days Leadership School for women was held at Newport. Bureau staff also provided three-day Leadership Schools at Molong and Scone for the C.W.A.

Two *Farm Management Schools* (four days each) were held—at Cowra and Blayney. Several other applications received could not be met.

Seven *Fertilizer Schools* were held—at Arcadia (one day), Dubbo (two days), Glenquarry (one day), Goulburn (one day), Tamworth (two days), Trundle (two days), Orangeville-Werombi (two days); and one *Fertilizer Course* (a night per week for six weeks)—at Wyong.

Two *Soils and Botany Courses* (a night per week for five weeks) were held—one at Coonabarabran, and one for the United Pest Controllers Association.

Four *Drought Feeding Schools* were held—Inverell, Dubbo, Muswellbrook, Dungog—and drew attendances of 182, 80, 160, 100.

Others included a two-day *Vegetable Growers School* at Muswellbrook; two *Sub-tropical Pasture Schools* (two days)—at Bexhill and Urunga; two one-day *Fruit Packing Schools*—Oakdale and Bilpin; and a *Sheep Nutrition School* (two days)—at Cooma.

Twenty-nine *Homemaker Schools* (one day) conducted by the Women's Service were also for and through Agricultural Bureau branches.

Beef Cattle Breeders' Competition.—This drew 181 entries. As in the past, the field days associated with District and State judging were important extension aids. Attendances ranged to as high as 150.

New Policy Approach to Branch Sitings.—Early in 1964-65 the Bureau State Council decided to depart from the tradition of branch formation in small localities. The new policy is to form branches based on major towns. This is the attempted counter to the effect of rural television on attendances at meetings of branches in smaller localities. Under the new policy, branches formed at major towns do not attempt monthly general meetings; their business is conducted by a "Committee of Management" comprising 8-12 members; they programme 3 to 4 major feature activities for the year—a field day, a convention, a school, a course or seminar, etc.; branch membership is enrolled on a bank order system. Under this system Baradine, which pioneered it, has a membership of 153, compared with eight in 1962-63.

Since adoption of the new policy, branches have been formed at Inverell (145 members), Bingara and Forbes, and dates have been set for similar formations at Dubbo, Coonabarabran, Mudgee and Boorowa. The "new approach" has been appreciated by field officers and others who are drawn into Bureau meetings.

Women's Extension Service

Schools and Allied Group Events.—Forty-three *Homemaker Schools* (one day) on locally selected subject matter were held, compared with 13 in 1963-64; one *Dressmaking School* (three days) was held, as against two in 1963-64; six *Leadership Training Schools* were conducted, or assisted tutorially, as against four in 1963-64; three *Home Nursing Schools* were sponsored, using external tutors; sessions for women's interest were provided at seven Agricultural Bureau major Conventions/major field days, compared with five in 1963-64; nine State/Regional/Divisional/District Council meetings of the Agricultural Bureau were attended for consultations on women's interest matters; talks were provided at 24 local meetings, including 14 Bureau branches, compared with 33 local meetings in 1963-64; women's sessions were provided at nine major functions promoted by rural organisations other than the Agricultural Bureau.

Press, Journals, etc.—Twenty-one women's interest articles were provided for the weekly *Press Copy*, compared with 36 in 1963-64; 53 items were issued for Regional Publicity Officers' use, compared with 32 in 1963-64; 18 articles, compared with 14 in 1963-64, were provided for the monthly *Agricultural Gazette*; three handbooks for Homemaker Schools were prepared and edited; printers' proofs for a *Home Freezing* booklet were checked, as were proofs for booklets on *Preserving Fruits and Vegetables* and *Jam Making*.

Radio and TV.—Tape recordings for rural radio usages totalled 111, compared with 130 in 1963-64; and two rural television segments were presented.

Correspondence.—Correspondence from rural women on home maker and craft matters increased to 453 letters, compared with 127 in 1963-64; and correspondence re one-day schools increased to 258 letters, compared with 138 in 1963-64.

Extension Service/Methods Training; and Examinations

The Division of Information Services organised and staffed three residential training schools in this category; the two-weeks in-service training school for 45 Departmental Officers in January, 1965, at Hawkesbury Agricultural College, and a one-week school respectively for 2nd Year University of Sydney Agricultural Science undergraduates and 2nd Year University of New England Rural Science undergraduates. The Division also provided the extension service training content of a one-week residential school at Newport for Plant Diseases Inspectors, organised by Division of Horticulture.

A Regulation 124 Higher Salary Grades examination paper on Agricultural Extension Methods was set and marked by the Chief, Division of Information Services for the August, 1964, examination of field officers.

Short Schools and Courses

This was a record year for number of (132) and range of subject matter in short-term schools and courses. Even so, the number and range could be much greater if teaching resources were sufficient to cope with the demand.

The Division's extension officer (short-term schools/courses organiser) assisted in the organisation of a majority of the schools and courses wherein the Department and/or the Agricultural Bureau had primary roles. Also he attempted complete records of these events.

The details recorded by him have been appropriately filed, including: location, attendance, duration, subject matter and the organisation(s) primarily responsible.

For the purpose of this Division's report his "Block Summary" may suffice; as follows:—

	Number held 1964-65
(1) Agricultural Bureau Schools/Courses ..	29
(2) Departmental Schools for Farmers	27
(3) Departmental Schools for Junior Farmers	3
(4) Women's Service Homemakers Schools ..	44
(5) Departmental In-service Training Schools	10
(6) Departmental Special Instruction Schools	3
(7) Departmental Schools for Various Industry Operatives	16
Total	132

REGIONAL EXTENSION SERVICES

General

The progress of decentralisation of administration of extension services continued.

Also, the Chief of Regional Extension Services continued to be responsible to the Director-General for administration of Commonwealth grants affecting the efficiency of extension work. These, the Agricultural Extension Services Grant and Dairy Industry Extension Services Grant are direct to the N.S.W. Department of Agriculture from the Commonwealth Department of Primary Industry. Currently they total £164,000 per year. Since the first was made in 1949 the grants to N.S.W. have aggregated £1,958,151. They continued this year to influence considerably the development of the Department's agricultural advisory services and methods.

TECHNICAL PERSONNEL IN REGIONS

Of the 484 officers located in country districts, excluding Research Station and College and veterinary personnel, for advisory and allied services, 431 come under Regional administration, 40 more than was so a year ago.

Additional officers appointed to Regions this year included a District research agronomist, a District livestock research officer, a District livestock officer (pigs) and four District livestock officers (beef cattle), two agricultural machinery officers, a dairy bacteriologist, two agricultural economics research officers, a milking machine survey officer, a seed certification officer, a fruit inspector, two herd recorders, and four clerks.

CLERKS FOR REGIONS

In 1963-64, establishment of Grade I clerical positions for seven of the nine Regional headquarters was approved and appointments were made to Wagga and Lismore. In 1964-65, four more of these positions were filled. Clerks were appointed to Maitland, Leeton, Goulburn and Tamworth.

The clerk has relieved the respective Regional Supervisor of a large amount of clerical and accountancy work, and has also been given work which formerly was done at Head Office. For example: travelling expense claims by officers in Regions where clerks have been appointed are now paid from a Regional Advance Account, and other local accounts including office rentals are paid from a Regional fund. Sale publications may now be sold in these Regions instead of only by Head Office; fees for seed certification and similar services are now received at Regional headquarters, and dairy farmer debits for herd recording are rendered by Regions instead of by Head Office. Local officers' leave records also are now maintained in the Regions.

An outstanding effect of the new clerical positions is the release of Regional Supervisors and District officers-in-charge from various office routines that had been reducing attention to bona fide agricultural extension organisation.

IMPROVED OFFICE ACCOMMODATION

Improvements in country office accommodation continued. Further developments have been planned and some are already proceedings.

Cowra.—Construction of the new office block for the Departments of Conservation and Agriculture actually commenced in 1962, but ceased when the contractor became bankrupt. Work was resumed late in 1964. The building will be completed in 1965.

Gunnedah.—The Gunnedah office accommodation has been inadequate for the increased staff. Acquisition of three more rooms, adjoining the present accommodation and until now occupied by the Soil Conservation Service, is proceeding.

Lismore.—There are plans for construction of a new building on the site of the existing premises. Current accommodation will be overtaxed when the three new positions already established are filled.

Maitland.—The Department occupies at East Maitland the entire building previously headquarters of the Shire Council and now owned by the Maitland City Council. Further appointments of extension and regulatory officers raised the need for more space. The City Council spent £8,000 on additions and alterations. New furniture has been supplied. There is now high standard accommodation for all officers at Maitland.

Orange.—Regional headquarters is in the Ophir County Council building, built only five years ago. Increased Department of Agriculture staff necessitated spread to five more rooms during 1963-64, and two more in June, 1965.

Tamworth.—The officers have been in rooms in the Lands Department's old building. Ample, modern accommodation will be provided for them in the new Government Insurance building. This is scheduled for completion in December, 1965.

Wagga.—Plans have been approved for two more floors in the Government building, making four in all—plus a lift and extra storage and garage facilities.

Other Offices.—Improved accommodation is now a fact at Cootamundra, Kiama, and Mudgee. Accommodation will be good in new buildings now being built at Albury and Inverell. In the many country offices not referred to in this Report the accommodation standards range from good to excellent, in terms of current needs.

Coonabarabran officers' accommodation is most unsatisfactory. Efforts are being made to get better premises for them.

TRAINING OF OFFICERS IN REGIONS

University and College Trainees.—The Department has 194 trainee officers at Universities and Agricultural Colleges, including an intake of 62 in 1965. In satisfying the "practical experience" requisites of the respective educational institution, the Department's trainees now acquire some of the experience by being located in Regions for appropriate periods. There they have close contact with agricultural advisory officers.

Training In-Service.—Each potential officer for extension, before he is allocated a District, is given experience by association with practising extension officers for up to twelve months in one or more Regions. As a result they are better equipped for duty as extension officers than would be so if they remained only on research stations before operating a District. This facet of in-service training has proved very successful. It will be expanded.

REGIONAL CO-OPERATION WITH OTHER DEPARTMENTS AND AUTHORITIES

Regional officers maintained contact with many Departments and authorities, with mutual benefit.

Other Institutions' Farms and Livestock.—Regular inspections and advisory reports were made on farming and livestock sections of institutions administered by the Departments of Health and Prisons, and the Aborigines Welfare Board. For the Electricity Commission, the Department of Railways, the Postmaster-General's Department, and any other Department upon request, property damage claims by landholders were investigated.

Weeds Schools.—Four Weeds Schools were held in Regions, primarily for attendance by officers of Shire and County Councils, the Railways Department, and Bush Fire Administration.

Regional Development Committees.—Regional Supervisors and several other senior field officers continued as members of Regional Development Committees of the Department of Decentralization. One Regional Supervisor is the Chairman of the respective Development Committee. Another Regional Supervisor is Secretary for the Development Committee in his territory.

Closer Settlement Matters.—The Department's field officers, in conjunction with the Department of Lands, inspected and reported on properties under consideration for closer settlement, and where closer settlement land allocations have been made, took special interest in advisory service for the settlers. The expanding establishment and efficiency of farms in the Coleambally Irrigation area provides a striking illustration; irrigation farms now total near 200—totalling 130,000 acres. District extension officers, especially the Griffith District agronomist, have spent much of their time assisting Coleambally settlers.

Investigations of Claims.—The Department's field officers have inspected and reported on properties affected by flood or bush fires where financial assistance has been needed through the State Flood and Bush Fire Relief Committee. The Chief of Regional Extension Services is a member of the committee.

Water Testings for W.C. & I.C.—172 water samples were tested at Western Region headquarters for the Shallow Boring Section of the New South Wales Water Conservation and Irrigation Commission, Dubbo. In other Regions many water samples were tested for the Water Conservation and Irrigation Commission and other Departments.

CONFERENCE OF PUBLICITY OFFICERS

A four days Conference of the nine Regional publicity officers was held in March, 1965. This occurs at intervals of two years. The discussions concerned best use of the various publicity media and channels to assist the Department's subject-matter officers; newspapers, radio, television, film, Departmental literature, and farmer meetings, field days, short schools and courses. During their conference, the publicity officers visited by courtesy of Artransa a television production establishment at Artransa Park. They visited also Rydalmere laboratories of the Division of Science Services.

REGIONAL CONFERENCES OF EXTENSION OFFICERS

This year a conference of all officers in Mid-Western Region was held at Cowra; on extension matters. A similar conference, of North-Western officers, was held at Gunnedah.

REGIONAL ADVISORY COMMITTEES

Each Region's Advisory Committee comprised seven primary producers, with the Regional Supervisor as chairman. Membership of the committee is by invitation of the Minister.

In May, 1965, the Minister requested each Advisory Committee to give special consideration to the drought and submit for his consideration advice on measures that should be taken by the Government and the Department of Agriculture to minimise drought effects now and in the future. The Committees held special meetings for these purposes and submitted comprehensive reports.

CONFERENCES, SCHOOLS, FIELD DAYS AND CONVENTIONS

Rural demand for short term schools and courses on agricultural, pastoral and fundamental science matters continued to increase. The schools held ranged from one day to four or five days in duration. The "courses", as distinct from schools, comprised one night per week for five or six consecutive weeks. Most of the schools and courses were sponsored by farm or pastoral organisations—often by a branch of the Agricultural Bureau. Departmental officers assisted in the detail of organisation and in most cases also comprised the teaching staff.

The schools and courses this year totalled 132; including forty one-day schools on facets of rural homemaking, provided by the Women's Extension Service officers of the Department.

CROP AND STOCK FIELD DAYS

This year at least 590 field days are known to have been held. The attendances ranged from a few persons to hundreds of persons. The "smaller" field days had the more intimate and seemingly effective extension atmosphere.

CONFERENCES WITH BANK MANAGERS

In the North Coast Region conferences with bank managers were held at various centres, to acquaint them with research and extension trends. Practically all managers attended, sometimes accompanied by a senior officer of the bank. Research and extension officers talked to them, especially on pasture developments. The talks were followed by general discussion and abundant questions. The information gained by bank managers would be of value in their determinations on loans to farmers. Two such conferences were held this year; one near Casino, attended by 12 managers, and the other at Macksville, with 23 managers present. More such conferences are to occur.

SHIRES' WEED CONTROL CONFERENCES

Weed problems confronting Shire Councils, and rapid development of improved chemical herbicides, have necessitated regular conferences on weed control in some Regions. In Mid Western Region the Regional Supervisor has been chairman of such conferences, held at intervals of six months. Shire councillors and aldermen, shire clerks, engineers and weed inspectors attended—from all local government bodies in the Region.

CO-ORDINATED EXTENSION SERVICES

In 1952, when the New South Wales Food Production Council was established, the "Co-ordinated Extension Services Scheme" was started. This provides machinery for Department of Agriculture extension officers, Rural Bank valuators, Conservation Service field officers and Milk Board field officers to confer and assure that agricultural advice to primary producers is based on Department of Agriculture recommendations.

The scheme has not made any recent development but is still operative.

LIBRARIES AND PAMPHLETS AT EXTENSION OFFICES

Mainly by use of Commonwealth Grant funds, selected reference books have been bought and good collections have been established in country offices for use by field officers. This year's purchases brought the aggregate expenditure to £5,350 and the total to 2,142 books so purchased.

Each of the nine Regional headquarters has a comprehensive library of agricultural publications, available to any officer in the Region. Each District office in the Region has a collection of books especially pertinent to the agriculture of the District.

For stocks of Departmental extension literature, held at each Regional headquarters, any officer in the Region has only to contact the Regional headquarters. Instead of numerous small consignments from Head Office in Sydney to the 46 offices in Regions, Head Office now consigns bulk quantities to the nine Regional headquarters—the bulked response to requests collated at the respective Regional office. Demand on Head Office by country people has diminished in accordance with the improved leaflet service in Regions.

Extension Aids

Agricultural advisory services of this Department have developed over the past 16 years as one of the best equipped extension forces in the world in terms of extension aids. This has largely been due to influence of Division of Information Services and access to Commonwealth Grant funds. The range of aids includes cameras, cine film and slide projectors, overhead projectors, public address systems, tape recorders, episcopes, copying and transparency-maker units, magnet and flannel boards; a lot of supplementary equipment including standard and lapel microphones, screens, ample supplies of black and white and coloured film for cameras, pocket-size viewers for slides, etc., and water and soil testing units.

Summary of Some Regional Publicity Activities

Press.—Publicity statements issued by Regional officers this year totalled more than 2,000 but about 500 fewer than in the previous year. The reduction was caused by greater use of television, greater use of radio, the increase of schools and courses for farmers—and the consequent reduction of time available specifically for press release writings.

Radio.—Forty-two of the country radio stations regularly used material supplied by the Department's Regions, and in fact had one or more regular, Department of Agriculture sessions per week. There were 5,272 broadcasts, made by officers or from material supplied by them. These occupied 700 hours on-air; an average of 78 hours radio time per Region. This on-air time is free to the Department.

Decentralisation of high quality tape recorders throughout each Region has been invaluable. Moreover, each Region now has at least one battery operated transistorised, portable recorder. This has facilitated acquisition of snap, field recorded interviews with farmers. These recordings are popular with radio stations—including usage in news sessions.

A development by many country radio stations that has found favour with the farmer and encouraged regular listening is the morning broadcast given at say 7 a.m., using mostly Department of Agriculture material.

Many of the regular sessions are titled programmes, e.g., "Digest"; "Agricultural News"; "Question and Answer". Most of these are 10 to 15 minutes programmes and comprise short statements by Department of Agriculture officers, brevities from their crop and stock monthly reports, and comments of local agricultural interest.

The regular programmes have been used also to publicize pending field days, conventions, schools for farmers, and other gatherings. Evaluation has shown this to be good publicity.

Television.—Officers in Regions started to use television in 1963. During the past year television really has taken on as an extension medium. Officers' enthusiasm for it has grown, despite the added work load—lightened only by "team" effort. Regular sessions are now being conducted by officers of six Regions. When more rural television channels open in the near future it is certain that there will be regular sessions in each Region.

This year, country officers provided 173 television segments—for a total on-air time of 31 hours and 40 minutes. The many additionals—news and other special items—brought the total near to 40 hours. As is so for radio, this television on-air time is free to the Department, and the sessions have been at good viewing times.

Extension *value* of the time given to television preparations and presentations has been higher than was anticipated. It is known to be effectively channelling technical information to farmers, also increasing farmer awareness of services available to them from the Department of Agriculture and, very importantly, enhancing public relations for the officers and the Department in general.

Notes Selected from the Reports of Specific Regions

MID COAST AND HUNTER REGION

Drought.—Mid Coast and Hunter Region had suffered greater production loss and farmland damage in the past few years than any other part of the State, through floods. This year the Region was more adversely affected than other parts of the State by drought. There was serious loss in dairy production. Many dairy farmers earlier hard hit by floods have experienced this further critical setback.

Already there have been serious stock losses. Every effort is being made by extension officers to help minimise future losses—by concentration of advice on drought feeding. So far, twenty "drought feeding schools" have been conducted.

Much of the gift fodder from other States will be dispatched to this Region, for the Maitland Supervisor's programmed distribution to necessitous farmers.

Regional Supervisor Mr H. A. Grantham, Retired.—Mr H. A. Grantham, an officer of the Department of Agriculture since 1929, retired on 15th January, 1965. Prior to his appointment in 1961, Mid Coast and Hunter Regional Supervisor, Mr Grantham's tour of duties had included the positions of District Agronomist at Armidale (twelve years) and District Agronomist, Maitland (five years). In 1946, he was in a special committee which at the request of the Commonwealth Government visited the U.S.A. to examine the hybrid maize seed production and the soybean industries. He had a major role in widespread, farmer acceptance of hybrid maize.

MID WESTERN REGION

Weed Control Conference of Shires.—A highly regarded Conference of Shire and Municipal Councils, seeking an integrated and co-ordinated noxious weed control programme, was held at Forbes in September, 1964. The Conference was organised by the Region. The Regional Supervisor was Chairman. Thirty local-government representatives attended. These included shire presidents, mayors of municipalities, and the clerks, engineers and noxious weed inspectors of shires and municipalities.

The Conference accepted and worked on a proposition that a more positive control programme would be possible through increased co-operation between local-government councils, and by emphasis on control of a limited number of important noxious weeds rather than dispersal of effort over the whole range of weeds.

The Regional Supervisor was elected permanent chairman of continuing Conferences. This will be held at intervals of six months to review and encourage the work of constituent councils.

Some Heavy Crops.—Wheat totalled 35,000,000 bushels, from 1,250,000 acres—probable records for the area, and almost a quarter of the State's record production.

Cherry production at Young reached a record of 407,000 x ¼-bushel cases—almost four times as greater as the production typical of ten years ago. Export of 780 cartons of cherries to Hong Kong, Malaysia, Perth and Darwin was of special interest. This trend is likely to continue. Also, 200 tons of white processing cherries was forwarded to Sydney and Victorian processors.

NORTH COAST REGION

Fewer Dairy Farms.—There are now 5,213 specialised dairy farms in the Region, as against 7,395 ten years ago. The apparent trends are to beef production and towards amalgamation of small units for more economic enterprise.

More than half the State's total dairy production, in terms of pounds of commercial butter, comes from this Region. The Region has slightly less than half the dairy cattle population of the State. Drought this year reduced the Region's production.

Banker Conferences.—Two bankers' Conferences were held in the Region this year. They were held at Ellangowan, near Casino, and Macksville. Twelve bank managers attended at Ellangowan and twenty-three at Macksville.

The conferences aimed to promote credit institution's improved knowledge of recent research and its applications, and to stress the need of longer-term credit to help farmers' progressive establishment of pasture legume programmes recommended by the Department. Sessions of these conferences also acquainted the bank representatives with the latest local developments occurring in the respective bank's district.

NORTHERN REGION

Drought Effects.—Following one of the most bountiful years, the first six months of 1965 comprised the driest period ever recorded. Practically no wheat has been sown. All stock are being handfed.

On the Northern Tablelands, few livestock deaths from starvation have occurred to far, but 50 per cent of cattle breeding stock have been moved away to agistment or for slaughter and sheep numbers have been reduced by 25 per cent.

The apple and pear crop was reduced by almost 40 per cent, to 700,000 bushels. Two dairy factories on the tablelands have ceased butter production, and milk and butter have been imported in large quantities to supplement local supplies.

NORTH WESTERN REGION

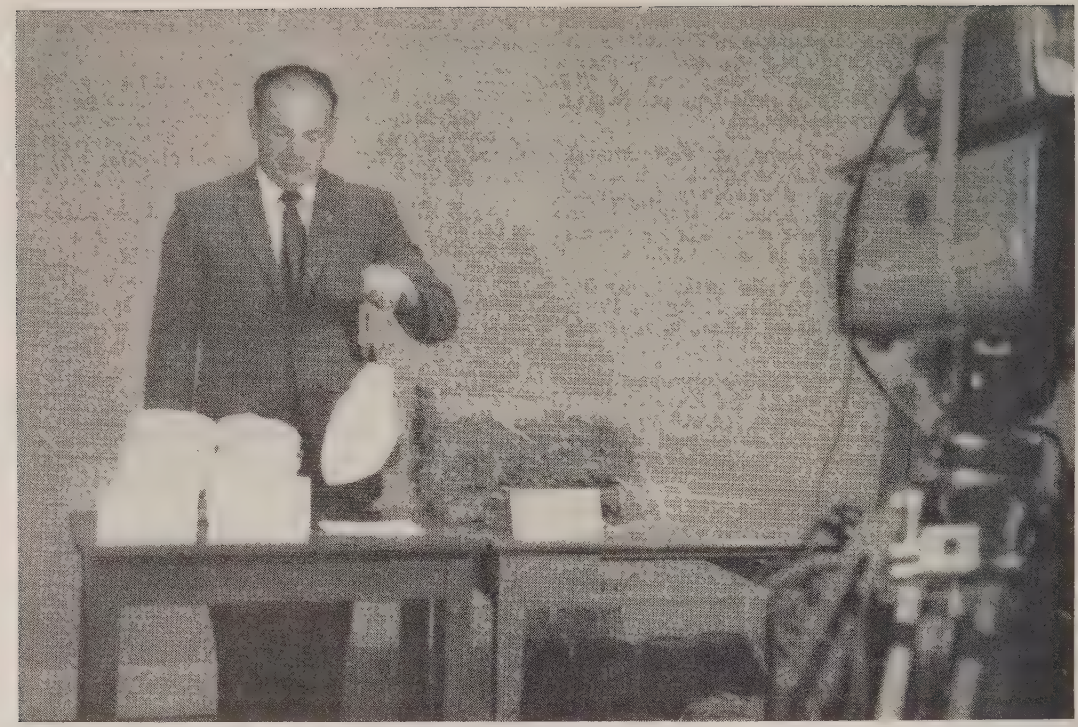
Drought Effects.—Rainfall since November, 1964 has been the lowest since 1902. Stock are being handfed on 80 per cent of properties. Conserved fodder is practically all gone. Wheat in silos throughout the north-west is being drawn on heavily to feed stock. All saleable, aged and surplus stock have been sold for slaughter. It is anticipated that only 40 per cent of the autumn and winter drop lambs will survive.

Wheat acreage sown has dropped from the 1¼ million acres sown in 1964 to just over 125,000 acres sown in 1965.

North-western extension officers have concentrated on drought-feeding advice. Eight "drought feeding schools" have been conducted. Thousands of pamphlets on drought feeding have been distributed.

Record 1964 Wheat and 1965 Cotton Harvests.—In contrasts to the now drought conditions, wheat and cotton production set records.

The 1964 area under wheat increased by 12 per cent to 1,276,000 acres and this produced a record of 36,700,000 bushels at a yield average of 28.6 bushels per acre.



Television Training for a Field Officer

The Department's Closed Circuit Television Unit provides officer-training, at the annual Extension Methods School and at Regional offices. This year, field officers totalled 40 hours on-air in presenting 173 segments of farm sessions at rural television stations.

Area under cotton, all irrigated, increased from 9,600 acres sown in 1963 to 16,000 acres sown in 1964. The weather was ideal for cotton growth and harvesting this year. Yield has been estimated as a record 27,000 bales of lint valued at about £2,500,000.

Increased Use of Fertilizers.—16,500 tons of superphosphate were used in North Western Region in the past 12 months, compared with 2,000 tons 11 years ago; and 15,000 tons of gypsum were used in the past year, compared with 1,300 tons 10 years ago. This represents a major change of attitude towards fertilizer usage in the north west.

Agricultural Machinery Officer Appointed.—An Agricultural Machinery Officer has taken up duty in North Western Region. Extension work in this field will be of untold value. Agricultural machinery is a major element in the economy of this Region.

SOUTH COAST AND TABLELANDS REGION

Disastrous Fires.—A fire in the Region early in March, 1965 burnt out 250,000 acres in the Goulburn-Bundanoon district; 55 homes, 30,000 sheep and 60 head of cattle, 225 acres of orchard and 34,000 bushels of fruit, and hundreds of miles of fencing were destroyed. The very dry autumn of 1965, following abundant pasture growth in the spring of 1964, produced the fire danger.

Regional, extension officers immediately undertook the organization of distributing gift fodder—donated by landholders within the district and elsewhere.

Adaptive Research Unit.—A sheep and wool research officer was appointed to the Region. He will work from Canberra, to investigate the low rate of stock increase in the Yass Valley area—a major centre of fine wool production.

The problem had been defined by the Southern Tablelands Regional Research and Extension Study (1957-62). The Yass Valley Organization sponsored the move to secure funds from the Wool Industry Research Committee. These funds have provided the Research Officer appointment plus equipment and materials.

The CSIRO Division of Plant Industry, Canberra, has provided office accommodation and the use of CSIRO facilities. This generous co-operation is appreciated. There is now a staff nucleus comprising a sheep and wool research officer and a pasture research agronomist for mobile, adaptive pasture and livestock research within the Region.

Research-Extension Groups Increasing.—There is increased interest in development of research-extension groups to provide fast means of testing new knowledge from research findings, towards speedier application by farmers.

The Yass Valley Organization has provided the example in South Coast and Tablelands Region, and this year two new groups were inaugurated. These are the South Coast Research Centre (based on Berry) and the Far South Coast Research and Extension Organization (based on Bega).

SOUTHERN REGION

Decentralized, Regional Accounting.—The first clerk to be appointed to a Region took up duty at Southern Region headquarters, Wagga, in April, 1964. The 1964-65 fiscal year has provided the first full 12 months operation of a decentralised, Regional accounting system. In the meantime, as reported elsewhere, a clerk has been appointed to each of five other Regions.

Southern Region's experience of the decentralised, clerical system has proved invaluable. Immediate, efficiency benefits accrued, by operating a Regional Advance Account to pay locally all travelling expenses, office rentals and other local accounts; and all revenue within the Region was handled locally—amounting to about £8,000 in the 12 months—as were payments, amounting to more than £12,000.

An important advantage of the decentralised, clerical system is that the Regional Supervisor has had much more time for extension problems including extension officer training and general improvement of extension services.

Television.—The Region accepted responsibility for a regular weekly television session called "Countryside" at RVN Channel 2, Wagga, and started it on 26th June, 1964.

The commitment has been fulfilled for 12 months. Officers of the South Western Region (headquarters at Leeton) assist the Southern Region (headquarters at Wagga).

The programme involves 15 minutes on-air each Friday night at 9.30 and the fifty sessions this year have totalled 12½ hours "on-air". The programmes are scheduled twelve months ahead so that each officer has long notice of his personal commitments to "the team effort". The subjects are shaped to interest urban and rural viewers. The television effort has proved to be excellent extension work with a marked effect on public relations. The Department and its extension officers and the services they provide are now far better known to the general public throughout the two Regions than was previously so.

SOUTH WESTERN REGION

Murray Research and Extension Committee Formed.—An extension organisation known as "The Murray Research and Extension Committee" has been formed. Its first meeting was held at Deniliquin on 7th October, 1964. Earlier, a public meeting had been convened by the President of the Wakool Land Holders Association in November, 1963, comprising representatives of this Department, the CSIRO, Rural Bank of N.S.W., the N.S.W. W.C. & I.C., Unversity of Sydney, and N.S.W. Soil Conservation Service, and local farmer organisations.

The new organisation affects the southern portion of the South Western Region and will promote and co-ordinate agricultural research and extension by providing for interchange of ideas and opinions between the component bodies.

Irrigation Development.—The previous annual Report mentioned the developments in Coleambally Irrigation Area. This Area, commenced at the end of 1959 will have 200 farmers by the end of this year. After the Blowering Dam is completed further farm settlement will occur, to a possible maximum of 800 farms. This dam should be completed in 1968. A further 70 blocks will then become available on Coleambally, and perhaps 50 more blocks per year until completion of the Coleambally scheme.

Private irrigation development from pumping from along the Murrumbidgee and Lachlan Rivers has assumed major importance; 250,000 acres are now being watered from licensed pumps. There is also irrigation development south of Deniliquin and between Hay and Booroorban, increasing the total for this scheme to 370,000 acres.

The Snowy Mountains scheme will make available for irrigation by farmers primarily in South Western Region an additional one million acre feet of water through the Murrumbidgee system and an additional 300,000 acre feet in the Murray system. The extra water in the Murrumbidgee system will be about three times the annual usage for the period 1952-56, and the extra in the Murray will be only slightly less than the annual usage for the period 1952-56. Based on existing lines of production, and a similar price structure, there is an estimate that this development would within 30 years mean production to the value of £41,000,000 to farmers and £123,000,000 in consumer goods.

WESTERN REGION

Television.—This Region's use of television as a good extension medium was a highlight in the previous year's Report. This year the use of television more than doubled, compared with the previous twelve months if number of television segments (62), not total on-air time, were the measure. In any case the on-air time increased from five to more than seven hours.

Experience from the previous 12 months improved the extension standard of the television sessions and enhanced their effectiveness. Production of television extension sessions has been time consuming, but results have justified the effort.

The television sessions, produced jointly by officers of the Western and Mid Western Regions, command an estimated audience of 160,000.

Radio and Press Usage Increased.—Promotion of television as an extension aid has not been made at the expense of other forms of publicity in this Region. Number of radio broadcasts increased from 743 in the previous 12 months to 803 this year. Number of press releases increased from 77 in the previous 12 months to 240 this year.

Schools for Farmers.—Fourteen schools for rural people were conducted in Western Region, seven more than in the previous year; including six one-day schools for women, two one-day "drought feeding schools" and one one-day "supplementary feeding school".

Re-formation of various branches of the Agricultural Bureau has led to more emphasis on the group facets of agricultural education for farmers. Plans already are in hand for not less than 10 schools in the coming 12 months, and this number is certain to increase considerably.

HAWKESBURY AGRICULTURAL COLLEGE

The Diploma Courses

A feature of the year was increased interest in agricultural education. The Agricultural Colleges Advisory Committee having determined "that the aims and purposes of the College be looked at continually and critically" and steps having been taken to raise entrance standards, alter enrolment procedure, and revise the Agriculture curriculum, the Martin Report recommendations on tertiary education were seen with interest.

From the Commonwealth financial aid in terms of the State Grants (Science Laboratories and Technical Training) Act, 1964, this College shared with Wagga Agricultural College a grant of £31,620. The two Colleges shared also 25 Commonwealth Technical Scholarships. Hawkesbury's share was £16,620 and 16 scholarships. Since the Commonwealth grant to technical education in N.S.W. exceeded £1¾ million the amount allocated to the two Colleges seemed disproportionately small. A more equitable future share has been requested even though the allocation formula would have to be altered.

The money received did provide notable improvement in student training equipment and facilities.

DIPLOMA IN AGRICULTURE COURSE

New Entrance/Enrolment Standard, and Curriculum.—The last, "old system" enrolment has been made. The new entrance standards and selection method, outlined in the 1963-64 Annual Report, will apply from 1966.

Coupled with this change as from the 1966 intake will be a revised curriculum. This will apply to First Year only in 1966. It takes into consideration the need to provide adequate training for what has come to be regarded as the "career type" diplomate. But there is no intention at this stage to alter too drastically the character of the course whereby it produces also diplomates with an all-round theoretical and practical knowledge of the arts and sciences applicable in agriculture. The new course will still suit prospective farmers who gain enrolment and have the ability to cope.

Independent Examining.—Wagga Agricultural College since inception has been bonded to Hawkesbury by common final examinations, firstly with external examiners and more recently with internal examiners. On recommendation from the Agricultural Colleges Advisory Committee the two Colleges will examine independently in future. A common assessor will ensure for each subject that standards are comparable. But each College is now free to exploit fully any advantage in facilities and staff.

Effect of Practical Training Supervisor.—Improved effectiveness of practical work made possible by the appointment of a Supervisor of Practical Training in January, 1964, was reported last year. It has been consolidated. This aspect of the course will be carefully regarded in the curriculum revision.

DIPLOMA IN DAIRY TECHNOLOGY COURSE

New Entrance/Enrolment Standards.—Entrance standards and enrolment procedure applicable to the Agriculture Course will also apply to this Course as from 1966.

Demand for this course in 1965 was so great that 23 students were accepted; one more than was regarded as maximum enrolment for First Year.

Curriculum Revision Proceeding.—Thorough revision of the curriculum has been initiated. Meantime some subject matter has been re-arranged.

Milk and cream testing and grading have been deleted from the course in General Dairying. This subject matter is examined under the Dairy Industry Act and many students qualified before College enrolment. Students not possessing these qualifications will get a concentrated course in it early in the first term.

Asian Interest in the Training.—Interest from Asian countries continued. These are two students from Thailand, sponsored by the Australian Dairy Produce Board, and one from the Philippines, sponsored under the Colombo Plan. The Australian Dairy Produce Board's offer to provide needed plant and equipment for a milk re-combining plant has been accepted. This acquisition will increase the scope of practical training and help the students to keep abreast of this important development.

DIPLOMA IN FOOD TECHNOLOGY COURSE

Entrance Standards.—The present entrance standards and enrolment procedure will still apply. They will be reviewed when the first of the 6th Year Higher School Certificates, result of the Wyndham Report, are awarded. The minimum standard now is the N.S.W. Leaving Certificate with emphasis on English, Mathematics and Science.

Demand for these Technologists.—Demand for food industry technologists has increased to a point where an assessment of the capacity to meet it with present training avenues is needed. Allied is the need for the industry to attract sufficient young men of calibre to undertake training for these vocations. There would be few industries with as much vocational technology potential, as the food industry, that have had so little public recognition of the potential.

The Hawkesbury Food Technology Diploma Course role in training men for the future of this expanding industry needs careful attention. It is of interest that the Food Technology Association of N.S.W. has recognised the important role of the Hawkesbury College Diploma in Food Technology, by providing a scholarship.

General

In-Service Training for Lecturers.—The usual in-service training of junior officers proceeded, and staff were given the chance to attend special short-term schools and conferences.

Four officers are undertaking degree courses through the University of New England External Studies Department: two for the B.A. and two for the B.Ed. (Admin.).

Two officers have been accepted as candidates for the University of Sydney M.Sc.Agr.

The College has become an institute member of the Association for Programmed Instruction. It is intended that lecturing staff shall keep abreast of developments in teaching aids and techniques.

Student Tours and Visits.—The annual instructional tours and visits were conducted. The Supervisor of Practical Training is widening the scope and improving the effectiveness of tours and short visits. Third Year's annual tour has in fact been altered to allow students to visit a part of the State suiting their particular needs. Tours will be under notice in revision of the curriculum.

English Expression Course.—The remedial 30 lecture course in English Expression, commenced in 1963, continued as a First Year curriculum feature in each diploma course. Only due to the difficulty in getting the services of teachers, about 40 per cent of the First Year students were exempted.

Counselling.—The system of an officer as counsellor, to a group of about 20 students, continued. Also, though the College has not the responsibility of finding positions, one officer kept students informed on career opportunities.

Extra-Curricular Activities.—The Students' Representative Council, the Sports Club, the Debating Society, the Camera Club, the Student Christian Movement and the College branch of the Agricultural Bureau continued, contributing to College welfare and social life.

The Australian Colleges Intercollegiate Contests in rifle shooting and tennis were held at Roseworthy Agricultural College, South Australia, in August, 1964.

A development worthy of note was the students' decision to form a Service Club, the "Hawkesbury Collegians". Participating students will carry out physical work of charitable or community service nature within a short radius from the College. The first project will be completed shortly.

Public Relations.—Visitors' Day (Thursday) arrivals are so constant that staff and students continue to be rostered to attend them. By special arrangement on other days, including weekends, parties have been allowed to tour. The majority have a real interest in the activities. The visits are accepted as an effective, important type of extension.

Agriculturists from other States and from overseas, including some from Asian countries who are usually Colombo Plan Fellows, were among the visitors this year.

Short Course Schools and Conferences.—College facilities and in some cases staff were made available for the following short-course schools and conferences:—Agricultural Bureau Congress; School for Dairy Factory Apprentices; School for Dairy Factory Operatives; School for Food Factory Foremen; Milking Machine Survey Officers' School; School in Apiculture; School for Department of Child Welfare Officers; Departmental Extension Methods School; Citrus Growers' Council Annual Meeting; Junior Farmers' Fodder Crops School; Junior Farmers' Dairying School; District Agronomists' Conference; Food Technology Diplomates' Biennial Conference; Milking Machine Testers' School; Herd Recorders' School; Fruit Inspectors' Extension Methods School; Poultry Farmers' School; Agricultural Engineering Society School; Pig Farmers' School; and also the Annual Poultry Farmers' Field Day was held.

Student Enrolment Statistics.—Statistics of student enrolments for the various diploma courses from 1955 to 1965 follow:—

Course	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Agriculture	200	198	182	187	187	190	192	187	189	192	181*
Dairy Tech.	15	24	34	33	33	32	32	32	31	25	35*
Food Tech.	9	12	17	16	17	15	19	25	28	22	23
Total	224	234	233	236	237	237	243	244	248	239	239

At the start of 1965, a total of 239 students was admitted (*three in Agriculture and one in Dairy Technology later withdrawn). Of this total, 181 are pursuing the Agriculture course, 35 the Dairy Technology course and 23 the Food Technology course.

Educational Standards at Entrance.—The trend of most students entering the College Diploma Courses with a higher than the present minimum standard continued. The educational standard of entrants in 1965, compared with 1964 was as follows:—

Standard	Agriculture Per cent.		Dairy Technology Per cent.		Food Technology Per cent.	
	1964	1965	1964	1965	1964	1964
Leaving Certificate Pass	76	69	61	67	91	100
Leaving Certificate Failed ..	6	13	..	..	9	..
4th Year	13	16	..	9	..	..
Intermediate Certificate	5	2	39	24	..	..
	100	100	100	100	100	100

Diplomas and Passes Awarded.—The Diplomas and Passes awarded in 1964, compared with those of some recent years, are shown:—

	1960	1961	1962	1963	1964
Diploma in Agriculture	58	57	52	53	47
Diploma in Dairy Technology	17	13	16	13	11
Diploma in Food Technology	7	7	9	13*	11
Passed 2nd Year Agriculture	57	54	54	51	49†
Passed 1st Year Agriculture	57	60	52	57	65†
Passed 1st Year Dairy Technology ..	11	16	13	12	10
Passed 1st Year Food Technology ..	6	11	12	11	8

* Includes one 1962 student, permitted to attend the 1963 final exam.

† Includes one 1963 student, permitted to attend the 1964 final exam.

In 1964, four Class II Honours were awarded in Agriculture, three in Food Technology, and one Class I Honours in Dairy Technology.

Vocations of the 1964 Diplomates.—Of last year's 47 Agriculture diplomates, 19 are employed on farming and grazing properties; nine entered State Departments, and eight entered other governmental agencies; private firms accepted six as technical representatives and in other capacities; three entered companies associated with agricultural and pastoral industries; two are in miscellaneous positions.

Thus, 36 Diplomates of the 1964 class are either on the land or employed in governmental agencies. Most in the latter category plus the nine employed by private firms are directly or indirectly applying their College training to the promotion of better Agriculture.

Sources of Enrollees.—Of 178 students currently enrolled in the Diploma in Agriculture course, 66 are sons of farmers. Of the 63 students enrolled in First Year, 24 are sons of farmers.

National character of the training in both the Dairy and the Food Technology Courses is again emphasised by the admission from other States and the employment of many diplomates in other parts of the Commonwealth.

Admissions to First Year of the Dairy Technology Course in 1965, included 16 from New South Wales (including eight factory apprentices), two from South Australia and one each from Western Australia, Queensland, Tasmania, Thailand and the Philippines. Two students were admitted from the Werribee Dairy Certificate Course, direct into Second Year.

Of the 23 First Year Dairy Technology students, only two are not sponsored.

In terms of States, employment of the 385 Diplomates from this Course since 1928 is as follows:—N.S.W. 273, Victoria 46, South Australia 19, Tasmania 15, Queensland 15, Western Australia 10, Australian Capital Territory two, outside Australia five.

Admissions to First Year of the Food Technology Course in 1965 included 14 from New South Wales; and one from South Australia, making a total of three interstate students currently in the course.

The first diplomates of the Food Technology Course completed their course in 1952. The 93 diplomates up to 1964 are now employed thus:—N.S.W. 57, Victoria 18, South Australia three, Queensland two, Tasmania three, Western Australia one, overseas ten.

Works and Improvements

The Beef Cattle Section's building was modified to provide office space and a suitable student demonstration room; feed stalls are under renovation, wall tiling of the bails and milk room was completed, and an eight-can cooler and a roller grinder were installed in the Dairy Cattle Section; the Orchard Section shed was remodelled to provide a student demonstration room; resurfacing of the cook room floor and wall tiling were completed, and cold room/quick freeze compartment doors were replaced, at the Cannery; by renovations at the School of Engineering an office, a student demonstration area and improved storage space were provided; the kitchen/dining room were completely re-painted and cupboards modernised; the roofs of Valder and Thompson Accommodation Blocks were tiled; extensive renovation of two Common Rooms was commenced; an anaxial flow electric pump was installed at the Turkey Nest Dam; at the Poultry Section a gauzed annexe was built for the killing room to improve hygiene, and the egg and incubator rooms were completely lined; in the Sheep Section, Stage II renovation of the old shearing shed provided a student demonstration room; alterations at the Dairy Factory improved the storage and office space, whilst new plant included a cheese vat with travelling agitator and a processed cheese plant; a suitable Groundsman's Shed for storage of plant and equipment was acquired by alterations to the old store; and an 8-in water main was laid in parallel with the existing and inadequate 6-in main supplying the College.

A new cottage was constructed for the Supervisor of Practical Training.

Sectional Operations at Hawkesbury

FARM SECTION

The Seasons.—Following a major flood in June, 1964, moderate dry conditions set in until early November. Irrigation was needed in this dry period, for maximum growth. But dry area crops, particularly cereals, persisted well on sub-soil moisture stored from the previous flooding. Fair November rains aided cereal production. Irrigation was needed for satisfactory yields of the summer crops maize, sweet and grain sorghum, lucerne and pastures.

The summer from late November through to early April was very dry, with persistent westerlys. Where moisture was adequate, sub clovers and rye grass seeded favourably and the dry summer helped the carry-over of seed to the following autumn. Fallow preparation for autumn 1965 sowing was delayed due to very hard ground. Chisel ploughs were used to prepare most of the area seeded.

Favourable April rain gave excellent pasture regeneration particularly where previously irrigated, and allowed limited areas of cereals. The continued dry period late April to June led to complete use of all carry-over dry summer feed, and the loss of much of the germinated autumn pasture species. All stock were hand fed for this period. At 30th June, 1965 it seemed that hand feeding of stock would have to continue well into the spring. Only 1602 points of rain were recorded in the twelve months.

Cereals.—The cereal harvest was moderately good. From the 275 acres seeded, 130 tons of silage, 90 tons of baled hay and 100 tons of sheaf hay were stored. Valuable cattle feed was obtained from areas too thin to harvest. This season, 330 acres have been sown in the Farm section, and 120 acres sown on student instruction areas.

Use of nitrogenous fertilizers on the poor sandy soils used for these student projects is costly but is permitting harvestable crops, better utilization of the arable area, and also contributing a lot of fodder production.

The narrow cereal rotation continues, and will until balance of the arable area available and stock numbers is determined.

Summer Crops.—Summer crop production was only on irrigated areas at the River Farm. All crops were used for silage, except two acres of grain sorghum and two of maize grain left for student harvesting demonstrations. Twenty-three acres of Japanese Millet produced 220 tons of silage. Further, 220 tons of maize were cut. Millet and maize silage were used at the Dairy Section. The 80-ton sweet sorghum crop was stored as stock silage to overwinter beef cattle.

Lucerne.—With River Farm loss of 16 acres of established lucerne in the June, 1964 flood, hay production there was nil. Establishment of 19 acres of lucerne commanded by a sump placed near the town sewerage effluent drain has enabled some lucerne hay production.

Fodder.—This year 120 tons of cereal hay were used for horse feeding; 150 tons of sheaf hay are on hand and 100 tons of baled cereal hay are in store.

An amount of 65 tons of lucerne hay was produced, and 130 tons of lucerne pasture hay were purchased. With 25 tons on hand at the start of the year, and 35 tons now stored, 185 tons have been used for stock feed; 130 tons at the Dairy Section and 55 tons at the Beef and Sheep Sections.

A total of 650 tons of green fodder was cut for silage; and 200 tons were in overhead silos at the start of the year. Now 100 tons are stored. Some 670 tons have been utilised at the Dairy Section and 80 tons are now being used for beef cattle. Of 600 tons in reserve in underground pits 100 tons were utilised last winter for beef cattle, leaving now 500 stored below ground.

Wheat Grain.—During 1963-64 the wheat grain used was purchased from the Wheat Board. In 1964-65, 207 tons were transferred from other Stations and the rest has been bought.

Oaten Grain.—All oaten grain used was by transfer from other Stations, a total of 166 tons. This compares with 15 tons by transfer and 80 tons by purchase in the previous year. With 1,200 bushels now on hand, 8,300 were used for stock feed, 3,000 bushels more than in the previous year, due to the adverse dry autumn.

Rice.—Owing to the limited water and the need of fodder production from the lucerne area, the rice project was not sown.

Irrigation.—The overall irrigation scheme from water storage has not been fully successful, due mainly to the failure of the Hillside Dam. Repair of this dam has been left to the College; a prolonged task with present equipment.

Building up the Turkey Nest Dam wall for storage increase from 10 to 18 million gallons has been approved. It will be contract work.

Fencing.—Dog proof fencing of the Clarendon arable area was completed by 5 mile of new fence. Concreting of culverts at drains and waterways is required to complete the job. Three miles of internal fencing was renewed.

Drainage.—The main drain from Yarramundi paddocks through Londonderry area to the Driftway was contract cleaned. This will help drainage of these areas and the central administrative/residential area. Spoil from the drain was carted by College equipment to the Turkey Nest Dam, to be used in building up the wall.

Clearing.—Scrub land clearing to increase the grazing potential is slow and laborious with existing equipment. However, only 60 acres still await treatment in the central block, Richmond, Blacktown, Londonderry areas. Completion of these is important to fire control. Funds are anticipated for further clearing in the 300 acres of timbered Yarramundi country. This is urgent, for complete fire control, and it will allow sufficient area for the rotation needed in the student demonstration project.

Horses.—One stud mare and one hack were sold, two hacks were transferred, one hack died, and two culled horses were destroyed. Eight Arab foals and two crossbred foals were born, and one Arab foal died. At 30th June, 1965 there were 66 head of horses, including three on agistment; compared with 64 head, including three on agistment, a year earlier.

Machinery.—A New Holland forage blower, three-ton tipping trailer, side-delivery rake, meat trailer and crump liquid manure spreader were purchased for student instruction and general farm work. The David Brown Model 25 tractor was returned to the firm and a modern 880 Implematic was received "on loan". Tractor firms continued to support the College, with nine tractors now "on loan". A Massey Ferguson 35X petrol tractor for student instruction and two David Brown 990 diesel tractors were bought for general farm work.

AGRONOMY SECTION

District Trials, and Extension Work.—Vegetable, plant nutrition and weed control trials were established by research agronomists in many districts of the State.

Information and advice were given by correspondence, telephone and personal contact, arising from the research agronomy activities. Agronomists addressed field days and farmers' schools, at the College and in this and other districts.

Lectures to Students.—Lectures/demonstrations were given by research agronomists to College and University students, on subjects involved in research agronomy at the College.

General Crop Production.—Besides vegetables for the College kitchen, and for cannery operations in the Food Technology course, vegetables were supplied to the C.S.I.R.O. Division of Food Preservation for research.

Co-operative Research.—Co-operative research work was undertaken with the Universities of New South Wales and Sydney, the C.S.I.R.O. Divisions of Food Preservation and Plant Industry, the Australian Atomic Energy Commission, various Divisions of the Department of Agriculture in this and other States and New Zealand, and with commercial firms and private individuals. The co-operative weeds research programme with Geigy Agricultural Chemicals was continued with mutual satisfaction.

The Division of Plant Industry section of this Report of the Department incorporates information of and from the agronomy research at the College.

SHEEP SECTION

General.—For most of the year heavy hand-feeding has been needed. Spring drop 1964 lambs were sold off early because of no suitable maintenance feed. Some 60 tons of bought hay was used, and a lot of oat and wheat grain. Some 500 ewes are being prepared for lambing on hand-feeding.

Field Demonstrations/Research.—(1) Work by the Research Agronomist on pasture species quality evaluation for lamb production continued, requiring co-operation by this Section; (2) a student demonstration to compare two levels of urea supplementation with a protein supplement is in progress, similar to last year; (3) a Merino flock selection demonstration is progressing most satisfactorily, and some 280 ewes were mated this autumn in this long-term demonstration; (4) a stud ram preparation and comparison demonstration is proceeding, using two groups of College bred Merino rams equal for fleece weight and conformation scores; of these, one group is housed and fully prepared for showing whilst the other group is receiving normal flock treatment; (5) further internal parasite demonstrations have been planned for when the feed position allows; (6) large scale prime lamb management demonstrations have been planned, subject to funds for further irrigation in the Richmond area.

Flock Statistics.—1,090 sheep were on hand at 30th June, 1965, comprising 220 commercial flock ewes, 160 research flock ewes, 280 Merino flock ewes, 110 Merino hoggets (ewes and rams), 80 rams, and 240 ration and general demonstration animals.

In the research flock, from 140 ewes mated the 'lambs marked' was 101 per cent; in the commercial flock, from 270 ewes mated, 113 per cent; in the Merino flock, from 170 ewes mated, 94 per cent. For all flocks, from 580 ewes the 'lambs marked' was 105 per cent.

Shearing 1964-65.—35 bales, a total weight of 10,948 lb greasy wool, was the yield.

Transfers of Sheep.—To other Farms, 2; from other Farms, 582; rations to kitchen, 731; purchase, 7 rams and 97 Merino ewes.

DAIRY CATTLE SECTION

Competitive, Cattle Exhibits.—A team of 15 head of College Friesians was successful at the 1965 Sydney Royal Show. The team won 10 Firsts, six Seconds, eight Thirds and one Fourth; also Reserve Champion heifer; and the College gained the Most Successful Exhibitor prize for the fifth consecutive year.

A College team of eleven head of Friesians was also successful at the Hawkesbury Show. The team gained ten firsts, two seconds and one third; champion bull; champion heifer; and reserve champion heifer.

Friesian Stud Numbers.—At 30th June, 1965, the stud totalled 160 head; comprising five adult bulls, seven loan bulls, fifty cows in milk, six cows dry, forty-four heifers, and forty-eight calves under twelve months; as against 173 head a year earlier.

Births for the year totalled fifty-six; comprising twenty-eight males and twenty-eight females, compared with a total of sixty-seven for 1963-64 comprising twenty-five males and forty-two females.

Stud Sales.—College Friesian Cattle remain very much in demand. This year twenty-five Friesians were sold, for a price average of 77 guineas and total of 1,939 guineas, compared with twenty-nine head sold for 2,465 guineas in the 1963-64 season.

Breeding Programme.—Analysis showed that, excluding the sires of purchased stock and foundation stock, the Friesian females represent no less than twenty bulls. Breeding has been mainly by artificial insemination.

The sires used at present are the imported Canadian Friesians, Frasea Lord Jewel, Sniders Fond Hope King and Trailynd Royal Beau. Another artificial insemination sire bred by the College—Hawkesbury Bonnie Voyageur—is also used occasionally.

The two bulls used for natural service on the heifers are Hawkesbury Pride King and Corhan Ross Castillian.

Herd Production Averages.—According to the latest herd recording figures released for the period to 30th June, 1964, the results are:—

Age	No. of Cows	Total Milk	Total Butterfat	Average Test
				Per cent
2 year old	6	9,085	325	3·6
3 year old	12	9,571	358	3·7
4 to 9 year old	33	11,959	448	3·7
Over 9 year old	3	14,825	527	3·6
Herd Average	57	10,806	402	3·7

Pasture Improvement.—Extensive improved pasture establishment has been carried out, but winter feed shortage still remains. Winter pastures sown in March/April are backward because of the adverse season. Cooba oats was sown, with the combine in one paddock and the sod seeder in another, but, although germination was good, rain is badly needed to obtain any feed from these paddocks. Lack of water for irrigation is a big problem.

Trials and Experiments.—These include:—Growth and development studies of Friesian calves; Solids-not-fat in the Friesian Herd; the identical twin heifer trial, and calf feeding and rearing by various methods.

Twin and Demonstration Herd.—Apart from identical twin heifers the College has a demonstration herd comprising two Guernsey cows from Yanco Research Station, two Jersey cows from Wagga Agricultural College, one Ayrshire cow and one Ayrshire heifer from F. A. McIntosh, Berry, and four A.I.S. cows from grade herds.

The identical twin herd comprises two pairs of milking A.I.S. cows and a set of young A.I.S. heifers.

BEEF CATTLE SECTION

The Beef Cattle Section now has the status of separate administration. Student instruction facilities have also been expanded, in keeping with the growing importance of the Beef Cattle industry.

Poll Hereford Stud.—Heavy culling was done, to improve breeding performance and beef type. Selection on production performance is now being practised. All breeding cattle and replacement heifers retained this year were on this basis.

The stud now comprises thirty-four females and ten males. Two adult bulls are on loan to the New South Wales Milk Board, located at Berry Artificial Stockbreeding Centre. Three adult males are in use at the College for both stud and commercial breeding and the remaining five are under twelve months of age.

A new stud sire, Kildrummie Toldeo, was purchased late in the year from Mr D. Carnegie, Holbrook.

One bull eighteen months old was sold to the University Farms, Camden and six heifers were transferred to Yanco Research Station. for demonstration purposes.

Increasing use is being made of this herd for student instruction on Stud Management practices.

Commercial Herd.—The commercial herd of Poll Herefords is proving invaluable for student instruction in commercial production and management practices. The herd now comprises thirty cows/maiden heifers and twenty-eight weaner calves.

Following heavy initial culling and continued adverse conditions, twenty head of surplus cows were sold to the Riverstone Meatworks late in the year. Also, some slaughterable animals were transferred to the College ration herd.

Ration Cattle.—The ration needs of the College are approximately two beasts per week. It is necessary to receive some on transfer from other Government farms, and thirty-two were received this year from the Tamworth Station. A total of ninety-seven head of beef were killed for rations this year.

Demonstration Herd.—Negotiations have been in hand this year to acquire two maiden heifers of representative beef breeds, through the various breed Societies. The animals are for instruction on breed characteristics and to demonstrate breed influence on crossbreeding practices. The College now has two Angus heifers and two Poll Shorthorn heifers, on transfer from other Government institutions, and two Devon heifers donated by the Newstead Pastoral Company, Glen Innes. Enquiries are proceeding regarding other breeds.

Cattle Numbers.—Cattle numbers overall have varied from as high as 184 in October, 1964, to the present total of 126 head.

Demonstrations.—Long-term demonstrations carried out this year were as follows:—(1) Steer production demonstration, including comparison of the economics of "feed lot finishing" with pasture feeding; (2) Creep feeding of beef calves, the economics and benefits of this practice; (3) Production selection of replacement heifers; (4) Speying of aged cows, as it affects conditioning for slaughter; (5) Fattening of backward store steers, to a slaughterable condition; (6) Fertility selection in the breeding herd, including pregnancy diagnosis; and (7) Influence of sires on rate of gain, using young bulls.

POULTRY SECTION

Breeding.—Normal breeding operations were carried out in the poultry and turkey flocks.

Third Pure Breeds Test.—The 3rd Pure Breeds Test finished in January, 1965, 500 days from the hatching of the sample. A full report has been published separately.

Fourth Pure Breeds Test.—Egg samples for this were set on 27th June, 1964, with 31 entries. Production records were summarised on the 141st day after hatching. The test will continue until the birds are 462 days old.

Twelfth Random Sample Laying Tests.—The 12th Random Sample Laying Test concluded in November, 1964. A full report has been published separately.

Thirteenth Random Sample Laying Test.—This commenced in August, 1964. It will continue for 462 days from date of hatching of each sample.

Fifth Random Sample Broiler Test.—This commenced with the setting of eggs on 22nd April, 1964, and finished when the birds were nine weeks of age. A full report has been published separately.

Sixth Random Sample Broiler Test.—This commenced on 5th May, 1965 and will end on 7th July, 1965, a period of nine weeks. Nine entries were received including one from Tasmania.

Annual Poultry Farmers' Field Day.—This annual event, held on Saturday, 5th September, 1964, again received strong support from the poultry industry and proved a useful occasion for the dissemination of industry information.

PIGGERY SECTION

Present Breeding Stock.—This comprises three Large White boars and nine sows, three Landrace boars and five sows, two Berkshire boars and four sows, two Tamworth boars and seven sows.

All aged brood stock was heavily culled. The herd now comprises mainly first litter gilts and young boars.

Stud Sales and Market Stock.—Enquiries for Stud stock have been heavy throughout the year, particularly over the latter half. With the reduced stock it was impossible to meet the demand. Forty-four stud animals were sold.

Glenfield Veterinary Research Station continued to take a steady quota of pigs for research purposes, though fewer than in the previous year.

Bacon curing was recommenced and approximately two pigs a week have been processed through the factory. Prices received for pigs marketed through the yards remained at very satisfactory levels. Eighty animals were sold through the yards and 242 were supplied for College rations.

Livestock, General.—Sixty-three litters were farrowed. One Large White in-pig gilt was introduced from the Department's stud at Wollongbar. This sow farrowed an excellent litter. Acquisition of this completely new line of blood should benefit the scope of the breeding programme.

The year was difficult in terms of herd fertility. Litter sizes were a lot below normal, and incidence of sows failing to hold service was more frequent. In part this was due to the proportion of aged sows in the herd at the start of the year and to the excessive ratio of boars to sows kept. However, the trend was noted throughout the State. It poses the question of whether the normal feed mixtures though adequate in normal times, are nutritionally precise enough to cope with the stresses from the prevailing, unfavourable climatic conditions.

Farmer Schools and Demonstrations.—A Pig Raisers' School was held, with full attendance. Participants' reactions to the school were very favourable. Demonstrations were done for the Agricultural Bureau Congress and the Sydney Technical College Animal Husbandry Course.

Student Demonstrations.—Growth and carcass quality responses to single and multiple protein sources were demonstrated; also aspects of temperature control and the effect of insulation in the pig houses upon performance efficiency; also the effect of varying levels of protein supplementations. Some sixteen different feed mixtures are in use. The effect of each on the performance of the pigs is fully displayed and recorded.

APIARY SECTION

Seasons.—Fine weather throughout the spring, summer and autumn for the first time for many years enabled more queen bees to be raised, although no surplus honey was obtained and mid-summer drought conditions affected apiary operations adversely.

The productive hives were migrated to the nearby mountains for an autumn honey flow from grey gum and bloodwood trees. These species' heavy yield of nectar and pollen provided sufficient honey for the bees' winter needs. Some of the combs of honey were removed for extraction demonstrations to students, then fed to nucleus colonies held at the College.

Demand for College-bred Queens.—The demand has increased throughout the beekeeping industry. A record total of 380 queens was supplied. Many favourable reports on their performance were received and more orders are in hand for the supply of special breeding stock as soon as available. The type required and supplied were raised from imported American strains of Italian bees, combined with other strains developed at the College by mating with instrumental insemination.

Summer School and Field Day.—The annual Summer School in Apiculture was held from 4th-9th January, 1965. Demonstrations were given, also, at the Amateur Beekeepers' Field Day held at the College on 13th March, 1965.

Statistics.—At 30th June, 1965, the Apiary comprised 50 productive hives and 20 nucleus hives, compared with 54 and 20 at 30th June, 1964.

FOOD TECHNOLOGY SECTION

Staff.—Though advertised three times, once interstate, no applications for the vacant lectureship in Food Technology have been received. It is now being advertised overseas. The Section's work has been seriously handicapped by the vacancy; a recurring problem since the inception of the Food Technology Course—six lecturers having been lost to industry in fourteen years.

Contact with Industry.—Contact has been by the lecturing staff, with beneficial interchange of information and industry assistance. Staff activities in this respect included: visits to commercial processing plants; active participation by the Lecturer-in-Charge as an honorary member of the N.S.W. Food Technology Assocation; participation in the N.S.W. Fruit and Vegetable Processing Committee's programme of research; and the holding of a Winter School for Factory Foremen at the College.

Education.—This is covered earlier in the report, under "The Diploma Courses".

Apart from the formal diploma course, the sixth Winter School for Factory Foremen was successfully conducted at the College in conjunction with the N.S.W. Food Technology Association. Forty-four representatives from industry attended, from the six States. Twenty-nine firms from diverse sections of the food processing industry were represented.

Processing Operations.—The basic aim of the practical cannery operations is education, not production. However, most of the preserved fruits and vegetables, and lesser items such as custard powder, jelly crystals, etc., used by the College kitchen were provided by the cannery.

This year the Section also participated in a co-operative project with the Prisons Department, in canning 4 tons of beetroot grown at Emu Plains Training Centre.

This year the Cannery produced 9,535 x 30-oz cans of vegetables, 4,700 x 30-oz cans of fruits, 1,150 x 30-oz cans of orange and tomato juices, 120 x 30-oz cans of tomato soup, 200 x 30-oz cans of tomato sauce; 4,410 lb of quick-frozen vegetables, 430 quick-frozen fowls and turkeys; 240 lb dehydrated vegetables; 3,170 lb jams; 7,100 lb fruit pulps; 450 lb of condiments and miscellaneous products such as custard powder and jelly crystals; and a range of other miscellaneous items for student practice.

SCHOOL OF DAIRY TECHNOLOGY

Surplus Milk Supplies, for Student Training.—Intake was low early in the year and nil in the late summer and autumn. With continuing severe drought, regular supplies of surplus milk are unlikely for at least several more months.

Student training was carried on by saving all milk from the College bails, for manufacture of small vats of cheese and drying small batches of milk.

Education.—This is covered earlier in the Report, under "The Diploma Courses".

Apart from the formal Diploma Course the facilities of the School were used for Short Courses for Dairy Factory Operatives and Dairy Factory Apprentices.

Thirty-seven apprentices attended the school for them at the College in May, 1965. This number is excessive where practical training is involved. It was apparent that more emphasis must be placed on lectures and demonstrations. Practical training will be restricted in future to those in earlier years of apprenticeship, to reduce congestion in their working in the factory.

Plans for a New Research Building.—The plans are complete; £5,000 has been allocated for 1965-66 expenditure on foundations and the preliminary part of the building.

Factory Production Statistics.—This year the Factory produced 213,303 lb butter; 82,822 lb cheddar and 874 lb fancy cheese; received and treated from external sources 1,800,065 lb milk; pasteurised 3,633,472 lb milk; manufactured 2,106 gals ice cream, 35,357 lb dried milk, 48 gals condensed milk, 59,152 v ½-pt cartons of flavoured milk and 290 gals of cream mix.

Dairy Research.—The details of dairy industry research, centred at Hawkesbury Agricultural College, have been incorporated elsewhere in this Report of the Department under "DIVISION OF DAIRYING".

WAGGA AGRICULTURAL COLLEGE

General

Staff.—The Principal, Dr F. C. Butler returned in November, 1964, from five months overseas. Whilst overseas he presented a paper at the Tenth International Botanical Congress in Edinburgh, attended as an official delegate the Seventh Commonwealth Mycological Conference in London, and investigated for a report on the courses of instruction at various Agricultural Colleges in the United Kingdom.

Mr J. Sutherland, Acting Principal during Dr Butler's absence, reverted to the position of Deputy Principal, and Mr K. G. Beirne, Acting Deputy Principal, reverted to his position as Senior Lecturer.

Mr J. D. Aiken commenced duty in February as Lecturer in Animal Husbandry. This is a new position, taking over that aspect of the former duties of the Veterinary Officer.

Mr G. J. Buggie, Economics Research Officer, has been stationed at the College from mid-February, as Lecturer in Farm Management. These lectures were formerly provided by an Economics Research Officer attached to the Wagga Regional Office.

Biology Lecturer Mr D. J. Campbell resigned in December, 1964. As at 30th June, 1965, a permanent successor had not taken up duty.

Veterinary Officer Mr B. P. Healy was transferred to Orange. Since his transfer, and until May, 1965, lectures in Veterinary Science and College Veterinary work were provided by Veterinary Officer Mr R. B. Bonner of the staff of the District Veterinary Office, Wagga. As at 30th June, 1965, lectures were being provided on a temporary basis by Mr L. G. Williams of Leeton Agricultural Research Station. Veterinary treatment was being provided from the District Veterinary Office, Wagga.

Dairy Officer Mr R. Bate resigned in December, 1964. His replacement is Mr D. B. Heptonstall, formerly Coff's Harbour District Dairy Officer.

A recommendation has been made to the Public Service Board for the filling of the position in Farm Engineering. Lectures and demonstrations in Farm Engineering, Tractor Maintenance, Surveying and Building Construction, Woolclassing, Wood Work, Metal Work and Welding were again provided by staff of the Wagga Technical College.

Lectures and demonstrations in Apiculture were provided by an officer of the Southern Agricultural Region.

Student Enrolment.—The 17th academic year commenced with the enrolment of 55 new First Year students and five new Second Year students, making a total of 126 students. Of the new First Year students only 7 per cent possessed minimum qualifications. The five admitted direct to Second Year had one or more years of instruction in rural sciences at University level.

The following table compares student numbers over the past five years as well as numerical distribution between the years.

Student Year	1960	1961	1962	1963	1964	1965
First Year	35	32	39	44	54	55
Second Year	31	34	31	37	32	41
Third Year..........	30	30	27	28	33	30
Totals	96	96	97	109	119	126
Percentage of Assisted Students	28·1	27·6	23·7	25·6	28·6	37·0

Diploma Examinations.—Of the 33 students who sat for the 1964 final examinations, 25 satisfied all requirements, two with Second Class Honours. Two others undertook with success deferred examinations in February, 1965. Three of the remaining six are repeating Third Year in 1965, and one student died under tragic circumstances in November, 1964.

Ex-students.—The total of Diploma holders since 1951 now stands at 313; a further 13 started at this College but gained their Diploma at other Agricultural Colleges.

The total number of ex-students now stands at 477, as follows:—

W.D.A.	......	313*	including 29 Honours graduates
H.D.A.	......	8	including 3 Honours graduates
H.D.A.	(Hort.)	4	including 1 Honours graduate
Q.D.A.	......	1	
		326*	
Non graduates		151	
Grand total		477	

* Includes one 1964 posthumous award.

Old Boys Union records disclose the following dissection of their activities:

(1) Following Agriculture—		
(*a*) on farms		220
(*b*) In Government Departments or with Quasi-Governmental Authorities—		
Agriculture	58	
Soil Conservation	13	
Education	4	
A.B.C.	2	
Valuer-General	6	
Others	20	103
(*c*) In commercial firms		51
		374
(2) Undergoing further training		17
(3) Left agriculture		32
(4) Occupation unknown		49
(5) Deceased		5
Total		477

Student Numbers.—An exceptionally large number of failures occurred as a result of the 1964 examination, but it was not considered desirable to use all of the resultant accommodation available. It was expedient to maintain First Year numbers at a reasonable figure, thus avoiding numerical imbalance between the years.

The admission of five new students direct to Second Year at once filled five vacant rooms and helped to balance the year numerically.

Curriculum Trends.—Experience in the past two years with the revised curriculum led to further modification of the Third Year programme. The main changes have been facilitated by less emphasis on time devoted to internal field work. Resulting available time has been devoted to increased studies in Farm Management and Agronomy. The latter have been implemented mostly by frequent whole-farm studies on private properties and by seminars and group discussions with College and Agricultural Research Institute staff.

Practical farm experience has been gained much more efficiently by students of all three years, in vacation employment on approved private farms throughout the State instead of by entire dependency on rostered, College field work.

The College is greatly indebted to numerous private farmers for their willing assistance in whole-farm management studies and provision of a high level of practical farm experience.

The Second Year curriculum in 1965 was virtually unchanged. The only variations were outcome of staff changes. One of these variations, as a result of the 1965 appointment of a Lecturer in Animal Husbandry, has been the expansion and greater depth of courses in Genetics and Nutrition previously delivered by the Veterinary Officer. Another varation, also affecting First Year, is mentioned in the next paragraph.

A significant variation of the First Year curriculum in 1965 was the transfer of Oxy-acetylene and Electric Welding instruction from Second Year to First Year. Thus, students leaving at the end of First Year will have had the benefit of instruction in these useful trades. The Welding instruction to First Year is being given in 1965 by College artisan staff. The Wagga Technical College staff, instructing Second Year this year, will in future years conduct the course for First Year.

Staff changes also necessitated some modification of content and teaching of Biology in First Year. But, in general, the revised and expanded curriculum has been followed.

Students' Extra-curricular Activities.—Extra-curricular activities included religious instruction and church services at the College, First Aid courses for new students, and assistance to local civic authorities in bush fire control.

The College competed in the Australian Agricultural Colleges Sports Contests, at Roseworthy in South Australia. Liaison and contact with public bodies was maintained through the Riverina Rugby Union and the Basketball, Cricket and Athletics Associations. Completion of a 33 metre swimming pool added a major amenity.

Student Tours.—Third Year students made the annual 5-day tour of central slopes, southern tablelands and coastal regions early in September, 1964. Second Year students spent four days on tour of the Gundagai-Tumut-Batlow-Tumbarumba regions early in November, 1964.

Senior students gained experience as stock attendants and in judging competitions at the Sydney Royal Show, the Wagga Wagga Show, the Wagga Ram Show and Sales, the Albury Sheep Show, and the Merino Ewe Breeders competition.

Half-day or one-day visits were made to local and district studs, and to other properties for Farm Management Surveys. Wagga Soil Conservation Research Station was also visited.

Short Schools and Conferences for Externals.—The 14th Annual Wheat and Sheep Husbandry School for Junior Farmers was held in August-September, 1964, during the last week of the vacation; 24 young farmers attended.

The 13th Annual Turkey Breeders conference and school was attended by 40 delegates and, as usual, was highly successful.

Works and Improvements

Water Supply.—A 20,000 gallon capacity concrete storage tank was added to the unfiltered water supply system. This increased the unfiltered water storage capacity to 75,000 gallons.

Irrigation Project.—Land preparation and construction of irrigation and drainage channels was completed in the flood irrigation section. It is now possible to irrigate about 100 acres, with a further 40 acres to be prepared as student demonstration projects.

The spray irrigation section provided excellent lucerne hay, lucerne forage, and grazing. Forage-harvested green lucerne supplied the only green feed available to the dairy herd during the dry conditions from January to April.

Also, the Irrigation section now has a cottage.

Roads.—A further 30 chains of the western access road was sealed. Forming and gravelling of other College roads continued. Considerable improvement to roadways and drainage at the Farm Sheds area was achieved.

Fencing.—Two miles of boundary fence was replaced, and one mile of subdivision fencing was erected. A new type of fence, an electrified permanent six wire type, was erected for demonstration purposes.

Swimming Pool.—The College 33 metre swimming pool was completed in April, 1965, in time for the Annual Swimming Carnival to be held in it. Dressing sheds are being erected by College Maintenance staff and well advanced.

Buildings, etc.—Besides the cottages at the irrigation section another, identical cottage was completed.

Cottage No. 4, rented by the Deputy Principal, was completely destroyed by fire in November, 1964. Tenders for erection of a replacement closed on 6th June, 1965.

Sectional Operations at Wagga College

FARM SECTION

Seasonal Conditions.—The year provided extremes in seasonal conditions. Late winter conditions were satisfactory and the spring and early summer conditions were ideal for both crop and pasture growth. High yields of grain, hay, and fodder resulted. The dry summer conditions were excellent for the cereal hay and grain harvests.

The remainder of the year was unfavourable. From early January to the end of June, 1965, only 350 points of rain were recorded at the College. These dry conditions resulted in almost complete absence of pasture growth, and germination of sown fodder crops was delayed until June. The conditions also seriously delayed seed-bed preparation and sowing of cereal crops for grain production.

Cereal Crops.—Conditions and improved soil fertility combined to again produce high yields of cereal grain. The yield average for barley grain was the highest ever recorded at this College.

Grain Crop	Area	Production	Yield Average
	acres	bus.	bus. per acre
Wheat	253	8,592	34.1
Oats	104	4,461	42.9
Barley	20	1,029	51.4
	377	14,082	42.8

In the grain harvested were quantities of seed wheat and barley grown for Division of Plant Industry and the Agricultural Research Institute.

Fodder Production.—A record harvest of 16,000 bales of pasture hay was conserved, and over 100 tons of cereal hay cut and stacked. Silage production was limited to 160 tons.

Other Crops.—Small areas of safflower and sunflower were grown for seed production. Four acres of peas were sown. Barley and oat variety trials were conducted.

Rabbit Control.—Rabbits were completely controlled on one of the rocky hills, by use of "1080" poison. Officers of the Pastures Protection Board Section did the poisoning as a demonstration to College students.

Bush Fire Control.—A two-way radio unit was fitted to the vehicle normally used by the Farm Supervisor. This linked the College with the Mitchell Shire Bush Radio Intercommunication Network. No bush fires occurred on the College but the unit assisted control of six fires within Mitchell Shire.

ORCHARD SECTION

Crops.—The weather from July to November, 1964, was alright for crop initiation of most fruit. After storm rains late in December, no rain fell for 14 weeks. The effect on fruit and trees was severe. Usable fruit was drastically reduced as compared with the previous year, and quality severely impaired.

Roads and Buildings.—The most used portion of the main orchard internal road was gravel surfaced and graded. The work area of the machinery shed was further concreted, leaving about one-third to be done. The old boiler has yet to be removed.

Demonstrations.—The pruning demonstration plot, trees in ascending age groups of one to five years, usefully demonstrated tree formation for student practice and was numerically sufficient also for the practical examinations. There were sufficient older trees of the main deciduous types for use in pruning for crop regulation. An area of vines has been developed as an extension to the tree pruning plot.

Nursery stocks were developed for budding and grafting practice and examination. Trees developed by the individual student as a result of examination of budding ability on three stocks, are his property. Students have individual choice of variety or kind within the limits of scion stock compatibility, and most of them work two or three on the one stock. This is a popular innovation.

Water Supply and Irrigation Facilities.—Improved water reticulation to the orchard has made possible some supplementary irrigation of trees and nurseries. Labour and time have been economised by this and there have been immediate gains in tree growth and fruit size in the irrigated area. The system also provides for the students a good practical demonstration of the different methods of orchard irrigation, assessment of infiltration and penetration of water in soils watered by different surface flow methods, and the different main types of irrigation sprinklers used commercially.

SHEEP SECTION

Section Improvements.—These are well under way, with more fencing and the planting of shrubs, trees and gardens. The wooden "counting out" pens of the woolshed are being replaced by steel piping. When finished, all yards, dip and races will be steel pipe and mesh. Sheep yard concreting has commenced.

Co-operation in Research, and Staffing.—Co-operation in research with the Agricultural Institute has been increased by addition of a second sheep and wool livestock officer to help with Institute trials and projects.

Competitive Exhibits.—At the 1964 Wagga Show the College sheep gained eight places from eleven entries.

Sheep Numbers.—These are similar to those of the previous year, but much of the older stock has been replaced with younger sheep.

Dorset Horn Stud Transferred Away.—The College Dorset Horn stud has been transferred to Condobolin Agricultural Research Station.

HORSE SECTION

Horse Numbers.—At 30th May, 1965, the horse total of 61 comprised three entires, 28 mares, 19 geldings and 11 foals; three more foals, one more gelding, and one less mare than 12 months earlier, but with the same number of entires.

Sales.—One stallion and one mare were sold for breeding. Two mares and one gelding were sold for slaughter.

Service of Private Mares.—Ten original and seven free returns were given this year.

Competitive Exhibits.—The stud gained Champion Stallion, Reserve Champion mare, two Firsts and a Second ribbon at the 1965 Sydney Royal Show.

BEEF CATTLE SECTION

Numbers.—At 30th May, 1965, the beef cattle total of 87 comprised 10 stud bulls (— 2, compared with 12 months earlier), 61 stud cows (+ 9), seven grade cows (equal) and nine steers (equal).

Sales.—Five stud bulls were sold. Eight Jersey steers and 20 Jersey cows were sold for slaughter.

Ration Beasts.—Forty-nine steers and 15 cows were killed for rations.

Transfers.—Forty-five steers and 16 cows were received from other Stations. One bull and six cows were transferred to other Stations.

PIGGERY SECTION

Numbers.—At the close of the 12 months there were 361 in the College herd.

Disease Position.—Quarantine for Rhinitis was lifted in October, 1964. The piggery was open from this time for inspection and stud sales, for the first time since 1960. Since October the herd has been disease free.

Stud Sales.—With restrictions lifted, stud sale enquiries started and sales occurred at increasing rates, reaching a peak when 11 stud animals were sold in the month of April, 1965. Enquiries and sales have since eased, as dry weather continued.

Demonstrations and Student Projects.—Two student demonstrations were carried out and three student projects were conducted.

The student demonstrations comprised:—

(*a*) The effects of three different protein supplements on growth rate and carcase quality, on three matched groups of pigs, receiving rations containing fish meal, meat meal and peanut-meal mixture respectively.

(*b*) To demonstrate the dramatic effect of inbreeding; by mating (i) a pure bred Berkshire sow back to her sire; and (ii) a crossbred sow back to her sire.

The student projects were done by:—

(*a*) A group of five students, where a litter was split up, and the effect of temperature on feed consumption and subsequent growth rates were studied in (i) the deep litter shed, and (ii) a paddock run.

(*b*) A group of five students where four sows (a Large White, a crossbred, a Berkshire and a Tamworth) were run as a separate herd; the students were required to feed and manage these sows and progeny on a stud basis over a long term, conducting all necessary operations.

(*c*) Two students with two sows, to compare the effects of early weaning, at two weeks, and normal weaning, at eight weeks, on sucker performance from birth to market weights.

Maintenance.—One large hill paddock was subdivided into three, pending extension of piping for automatic watering bowls. Lining of board pens with 3 in x 3 in weld mesh commenced.

DAIRY SECTION

Numbers.—A more rigid culling programme has been adopted, to improve the general standard of the College herd. The herd has been reduced from 157 head at 31st December, 1964, to 120 head at 30th June, 1965.

The College herd has been added to by inclusion of two Friesians, two Guernseys, two Ayrshires, one A.I.S. and one Jersey.

Sales.—The stud sales for the 12 months comprised 25 stud bulls and 19 females. Thirty-two head were culled to the Commercial Herd or Meatworks. Besides the sales, two cows were transferred to Hawkesbury Agricultural College for demonstration purposes.

Sale of milk and cream to staff and of butter to the Murrumbidgee Dairy Co. yielded considerable revenue.

Herd Health.—Heavy calf mortality experienced during 1964 when 19 calves died, appears to have been overcome by management factors.

Infertility is currently the main concern. Conception rate is poor in both the vibriosis "clean" and "dirty" sections. Venereal tests of the "clean" section all proved negative to vibriosis.

Production Performances.—Production average per cow was lower during 1964-65 than in previous years, due to reduced concentrate feeding of the herd.

There is no cow in the herd over 9 years of age. This is attributed in part to the excessive feeding of the younger cows during their developing stage. Forced feeding produced very high production figures but may have reduced the longevity of production.

Improvements.—New calf paddocks and feeding yards have been built. Combined with better management these have raised the standard of calf rearing.

A concrete drain has been constructed to carry water well away from the dairy and yards. New water troughs have been built into four paddocks previously without water.

Competitive Exhibits.—Teams of Jersey cattle were shown at both the Wagga Show and Sydney Royal Show.

YANCO AGRICULTURAL COLLEGE AND RESEARCH STATION

Research Activities

These are collated within the reports of the various Divisions with research personnel at this Research Station.

Farm Certificate Course

The one-year Course has grown to an intake of 85 students in 1965. Buildings now completed make possible an intake of 102 in the enrolments for 1966. The first intake for the Certificate was in 1963, with 38 students. The 1964 intake was 55 students.

This Farm Certificate Course has been specially designed for farmers' sons and for others who intend to go on the land, either as property owners or managers. Practical training in farm skills has been combined with agricultural "theory".

The following table shows the distribution of home areas of the 85 students enrolled in 1965.

Sydney	23	North West Plains	3
Riverina	10	Western Division	3
Central West Plains	10	Upper Hunter	2
Central West Slopes and Tablelands	5	M.I.A.	1
South West Slopes	5	Interstate:	
Southern Tablelands	4	A.C.T.	3
North Coast	4	Queensland	2
		Victoria	2
		Northern Territory	1

In 1964 only one student from the city was enrolled. Also, all except three in 1964 were either from the land or had definite plans for immediate return to a property. By contrast, in 1965 twenty-three of the 85 are from Sydney and those with no immediate prospect of going to the land total 26.

At the end of 1964 it was assessed that almost all students had derived considerable benefit from the course. This assessment is fully substantiated by subsequent letters from parents and/or by discussions with parents and the ex-students themselves.

The same confidence about the product of 1965 is not held at this stage. This is notwithstanding improved facilities and staffing and earnest staff effort. The reasons appear to be:—

(i) The high percentage of boys who have no immediate sight of an object.

(ii) The large proportion of students whose previous academic background is exceptionally poor. This appears to be the main factor. The course for this year was not fully advertised, and any student who made application was accepted—because there was room. Some had failed to pass their Intermediate Certificate examination. As was expected their work is well below standard and their interest is definitely waning at this half-way stage of the year. The comparatively large number in this category has had a depressing effect on the course as a whole.

Even though the academic standards for the Farm Certificate Course are definitely not high a reasonable standard is essential for the course aims to be fulfilled and a spirit of learning developed.

(iii) Larger enrolment numbers have necessitated splitting the course into two different units. These extra numbers have strained some of the farm facilities and also caused less individual attention for each student. In 1966 this trend will multiply with an intake of 100 students. Hence the need for improved academic qualifications to counteract this trend.

Staffing and equipment provided for the course have greatly improved since 1964.

GRAHAME EDGAR, Director-General.
30th September, 1965.

APPENDICES

I. Accounts of the Department of Agriculture, 1964-65.

II. The Published Matter of Officers of the Department of Agriculture, 1964-65.

APPENDIX I

The Accounts of the Department of Agriculture, 1964–65

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings and permanent improvements to departmentally-owned property is financed from the General Loan Account. In addition to these general classifications of expenditure, the Department is assisted in the financing of certain specified lines of research and development and the control of insect pests and animal diseases by levies on industry and by grants from the Commonwealth Government and public and private organisations. Operations of this nature are reflected in a large number of separate accounts within the general Treasury classification of "Special Deposits Account", some details of which are given elsewhere in this Appendix.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1963-64	1964-65	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Consolidated Revenue Fund	5,876,528 12 8	5,266,382 2 4	610,146 10 4 (Decrease)
General Loan Account	158,853 10 2	259,898 1 9	101,044 11 7 (Increase)
£	6,035,382 2 10	5,526,280 4 1	£509,101 18 9 (Decrease)

EXPENDITURE FROM CONSOLIDATED REVENUE FUND

The following tabulation is a comparison of expenditure by the functional Divisions of the Department for the last two financial years :—

Division	1963-64	1964-65	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Central Administration	1,903,898 6 9	1,038,085 4 9	865,813 2 0 (Dec.)
Science Services	222,819 13 4	231,706 1 1	8,886 7 9 (Inc.)
Plant Industry	276,373 19 8	293,300 19 0	16,926 19 4 (Inc.)
Horticulture	269,532 0 11	304,995 2 1	35,463 1 2 (Inc.)
Dairying	248,958 9 2	285,238 6 1	36,279 16 11 (Inc.)
Hawkesbury Agricultural College	289,837 0 8	297,636 14 10	7,799 14 2 (Inc.)
Wagga Agricultural College	146,713 16 4	161,949 11 10	15,235 15 6 (Inc.)
Research Stations (*a*)	572,766 0 6	587,686 10 9	14,920 10 3 (Inc.)
Animal Industry—			
Head and District Offices	768,672 11 5	829,135 3 5	60,462 12 0 (Inc.)
Queensland Border	102,673 17 6	107,128 6 2	4,454 8 8 (Inc.)
Tick Quarantine Areas	893,126 0 7	915,723 9 9	22,597 9 2 (Inc.)
Royal Botanic Gardens	181,156 15 10	213,796 12 7	32,639 16 9 (Inc.)
Totals £	5,876,528 12 8 (*b*)	5,266,382 2 4	610,146 10 4 (Dec.)

(*a*) Previously "Experiment Farms and Stations" (*b*) Included a recoverable advance of £1,000,000 to the Grain Elevators Board of New South Wales.

EXPENDITURE FROM GENERAL LOAN ACCOUNT

Expenditure from General Loan Account for the year was £259,898 1s. 9d. Of this sum £152,165 16s. 4d. was spent on the establishment of the Farm Certificate Course at Yanco Agricultural Research Station (making a total of £235,664 13s. 9d. to the end of this financial year), £51,647 2s. 6d. for additions to the Agricultural Research Institute at Wagga and a further £20,629 18s. 5d. for the Armidale Veterinary Diagnostic Centre.

The following are details of amounts expended from General Loan Account during the financial year 1964-65 on works at the various Institutions of the Department:—

	£ s. d.
Wagga Agricultural Research Institute—	
Additions—Agronomy Laboratory	51,647 2 6
Wagga Agricultural College—	
New Dormitory Block	4,997 18 5
Poultry Slaughterhouse	217 15 4
Swimming Pool	6,224 6 6
Cowra Agricultural Research Station—	
Mouse-proof Grain Shed	709 0 0
Dareton Agricultural Research Station—	
Erection of Cottage	109 11 6
Escape Channel	5,100 0 0
Griffith Viticultural Research Station—	
Packing Shed	2,451 4 0
Leeton Agricultural Research Station—	
Construction of Grain Shed	1,200 6 0
Narara Horticultural Research Station—	
Glasshouse—Electricity	137 0 0
Narrabri Agricultural Research Station—	
Axial Flow Pumping Unit	1,340 15 0

	£ s. d.
Orange Agricultural Research Station—	
Water Supply	4,000 0 0
Seven Hills Poultry Research Station—	
Cockerel Rearing and Holding Pens	546 12 6
Trangie Agricultural Research Station—	
Erection of Machinery Shed and Mechanic's Shop	12 16 6
New Administration Building	132 0 0
Wollongong Agricultural Research Station—	
Erection of Slaughterhouse, etc.	1,196 6 9
Yanco Agricultural Research Station—	
Agronomy Shed	3,479 12 0
Establishment of Farm Certificate Course	152,165 16 4
Glenfield Veterinary Research Station—	
Armidale Veterinary Diagnostic Centre	20,629 18 5
Laboratories and Conference Room	1,200 0 0
Modification of Isolation Boxes	2,400 0 0
	£259,898 1 9

COMMONWEALTH UNEMPLOYMENT RELIEF GRANT

There were no further allocations for the year 1964-65. The balance of £43 14s. 1d. carried forward from the previous year was spent on improvements at Centennial Park.

OTHER ACCOUNTS

Special Deposits Account

Following is a complete list of accounts and funds within the Special Deposits Account at the Treasury on which this Department operates:—

Name of Account	Balance as at 1st July, 1964	Receipts 1964-65	Payments 1964-65	Balance as at 30th June, 1965
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Advances to Officers for Purchase of Motor Cars	*Dr.* 123,083 1 2	60,928 13 1	47,358 6 7	*Dr.* 109,512 14 8
Potato Growers' Licensing Act, 1940	944 12 3	1,456 2 6	2,007 1 8	393 13 1
Commonwealth-State Flood Relief Scheme, 1964	59,250 0 0	30,000 0 0	64,104 2 3	25,145 17 9
Commonwealth-State Flood Relief Scheme, 1963	10,957 5 0	....	10,957 5 0	....
Balance of Salaries Adjustment Suspense Account	68,689 7 5	64,784 18 3	68,689 7 5	64,784 18 3
Commonwealth-State Bush Fire Relief Scheme, 1965	....	60,000 0 0	25,810 0 0	34,190 0 0
Government Printing Office—Working Account and Stores Account and Sale of Publications	....	1,012 9 6	67 19 0	944 10 6
Noxious Insects Destruction Account	53,799 18 9	81,686 2 11	91,852 14 7	43,633 7 1
Commonwealth Grant—State Secondary School and Technical Training Projects Financed under States Grants (Science Laboratories and Technical Training) Act 1964	....	31,620 0 0	5,202 5 2	26,417 14 10
Swine Compensation Fund	93,105 8 6	63,878 0 0	56,511 3 8	100,472 4 10
Hawkesbury Agricultural College Canning Factory Account	3,142 13 7	1,139 5 8	2,639 0 6	1,642 18 9
Bush Fire and Flood Relief Account (State)	8,548 13 1	....	170 0 0	8,378 13 1
Hawkesbury Agricultural College—Dairying Factory Working Account	60,885 16 5	198,081 14 8	184,771 14 2	74,195 16 11
Tobacco Industry Trust Account	832 19 1	10,003 1 2	7,001 16 5	3,834 3 10
Pasture Control Account	10,041 7 5	....	....	10,041 7 5
Potato Marketing Board of New South Wales—Funds upon Dissolution Account	1,390 9 10	56 4 11	857 6 7	589 8 2
Unclaimed Moneys Account	912 13 1	735 15 9	291 12 4	1,356 16 6
Commonwealth Grant towards the promotion of Improved Practices in the Dairying Industry	15,343 18 9	89,232 16 6	91,176 14 6	13,400 0 9
Commonwealth Grant—Expansion of Agricultural Advisory Services—New South Wales	14,294 7 11	83,056 7 1	79,098 12 3	18,252 2 9
Cattle Compensation Fund	727,912 13 2	305,244 5 1	247,712 9 10	785,444 8 5
V.P. Bragg Scholarship—Wagga Agricultural College	202 8 4	307 10 0	364 19 2	144 19 2
Wagga Agricultural College Swimming Pool Account	2,616 7 10	2,905 0 0	1,190 19 7	4,330 8 3
Wheat Industry Stabilisation Fund (Disposal) for Research and Extension in the Wheat Industry	9,921 16 10	15,879 5 9	19,061 3 11	6,739 18 8
V.P. Bragg Scholarship Account (Investment)	6,000 0 0	....	....	6,000 0 0
Wagga Agricultural College Swimming Pool Account (Investment Account)	5,500 0 0	....	....	5,500 0 0
Wheat Industry Stabilisation Fund (Disposal) for Research and Extension in the Wheat Industry (Investment Account)	95,731 0 0	....	11,731 0 0	84,000 0 0
Additional Poultry Housing for Random Sample Tests at Hawkesbury Agricultural College	*Dr.* 2,540 19 1	635 4 9	....	*Dr.* 1,905 14 4
Egg Marketing Board—Triennial Elections, 1964	....	501 18 4	501 18 4	....
Overseas Visit—W. T. Atkinson	....	1,000 0 0	1,000 0 0	....
Rice Marketing Board of New South Wales—Triennial Elections, 1964	....	138 1 2	138 1 2	....
Swine Fever Outbreak—Payment of Compensation	*Dr.* 50,000 0 0	50,000 0 0	....	....
Tuberculosis Eradication Programme	....	....	85 11 0	*Dr.* 85 11 0

Special Deposits Account—*continued*

Name of Account		Balance as at 1st July, 1964			Receipts 1964-65			Payments 1964-65				Balance as at 30th June, 1965		
		£	s.	d.	£	s.	d.	£	s.	d.		£	s.	d.
Hawkesbury Agricultural College Trust Account ..		7,963	17	3	8,385	17	0	9,283	19	11		7,065	14	4
Wagga Agricultural College Trust Account		2,731	3	2	2,603	1	9	2,204	9	0		3,129	15	11
Yanco Agricultural Research Station Trust Account		1,623	7	1	2,550	0	0	1,692	15	3		2,480	11	10
Australian Cattle and Beef Research Committee—Grants Pasture Species Investigations with particular reference to Summer Legumes		1,287	2	8	4,000	0	0	5,442	19	10	*Dr.*	155	17	2
Major and Minor Element Deficiencies in Soils from Beef Areas		1,233	12	0	2,672	2	5	2,694	2	1		1,211	12	4
Phosphate Levels in North Coast Soils with Specific Relation to Summer Legumes		375	13	8	3,500	0	0	3,555	10	0		320	3	8
Pasture Intake and Digestibility Studies—Production of more Beef per acre on Irrigated Pastures....	*Dr.*	193	2	9	5,855	11	6	4,709	3	9		953	5	0
Winter Nutrition on Northern Tablelands		290	16	5	3,000	0	0	2,591	12	0		699	4	5
Nature and Organisation of the Australian Beef Cattle Industry		102	9	9	1,900	0	0	1,896	10	4		105	19	5
Beef Cattle Improvement through Breeding Methods		692	9	0	7,318	1	5	6,786	13	5		1,223	17	0
Winter Feed—Beef Areas, North Coast		....			1,000	0	0	885	6	0		114	14	0
Sod Seeder Development		....			1,000	0	0	500	4	1		499	15	11
Inoculants for Summer Legumes		....			1,000	0	0	1,013	10	7	*Dr.*	13	10	7
Incidence, Importance and Control of Parasites of Cattle in New South Wales		....			1,000	0	0	677	15	10		322	4	2
Bloat Research		....			....			31	2	0	*Dr.*	31	2	0
Australian Dairy Produce Board—Grant for Research Projects—Socio-Economic Investigations	*Dr.*	1,567	2	10	7,682	0	0	6,536	14	10	*Dr.*	421	17	8
Expansion of Pasture Species Research		75	16	0	4,487	5	6	3,574	6	11		988	14	7
Expansion of Other Pasture and Animal Research ..	*Dr.*	2,235	15	6	8,800	19	6	8,550	1	6	*Dr.*	1,984	17	6
Dairy Manufacturing Research—Problems of Blue Vein Cheese Production......................		435	7	10	....			435	7	10		....		
Bacteriophage Antibiotic Interactions		1,973	16	0	972	11	0	2,745	15	0		200	12	0
Composition of Milk	*Dr.*	186	4	7	8,377	13	4	7,893	3	6		298	5	3
Efficiency of Detergents	*Dr.*	228	7	8	2,917	11	11	2,657	10	1		31	14	2
Flood Irrigation Research, Mooneba		....			1,000	0	0	1,408	4	2	*Dr.*	408	4	2
Milking Machines and Mastitis		....			500	0	0	361	2	10		138	17	2
Banana Research Committee Grant for Research....		648	19	0	3,117	19	6	2,546	15	8		1,220	2	10
Board of Tick Control Employees' Proportion of Contributions to Local Government Superannuation Scheme		7,426	1	3	18,087	14	6	17,089	13	1		8,424	2	8
Brown Rot Investigations—Trust Fund		702	8	7	....			29	5	0		673	3	7
Commonwealth Contribution towards cost of Investigation into excess Spray Residue on Fruit		60	1	7	4,980	0	0	4,347	18	3		692	3	4
Commonwealth Grant—Milking Machine Components Testing Station		399	13	10	750	6	2	1,263	13	8	*Dr.*	113	13	8
Commonwealth Unemployment Relief Grant		43	14	1	....			43	14	1		....		
Contribution by Australian Potash Research Institute for Potash Research		....			135	0	0	....				135	0	0
Contribution by Industry towards Research into Meat Meal quality at Seven Hills Poultry Research Station		345	12	10	....			166	5	0		179	7	10
Contributions by States towards Salary and Expenses of Patrol Officer, Grasshopper Control........		600	19	10	3,700	0	0	189	5	1		4,111	14	9
Contributions to Animal Insect Pest Investigations—Glenfield Veterinary Research Station		521	13	11	....			....				521	13	11
Contributions to Pasture Research—Mid-Coast and Hunter Region		1,066	9	2	1,500	10	0	1,349	19	4		1,216	19	10
Contributions towards development of Tamworth Experiment Station		675	2	4	....			....				675	2	4
Contributions towards establishment of Library at Agricultural Research Institute, Wagga		8	6	2	....			....				8	6	2
Contributions towards publication of an Australian Bibliography of Agricultural Economics........		....			1,675	0	0	....				1,675	0	0
Department of Agriculture—Suspense Account....		10,244	11	8	181,352	11	4	190,849	17	1		747	5	11
Donation by Australian Turkey Federation towards purchase of Incubator		....			358	0	0	....				358	0	0
Donation by I.C.I.A.N.Z. towards Pasture Fertilizer Nitrogen Investigations		246	13	6	....			....				246	13	6
Geigy Agricultural Chemicals Contribution towards Weedicide Research Project at Hawkesbury Agricultural College		92	14	7	71	10	1	101	11	8		62	13	0
Grant by Australian Honey Board for purchase of Truck		....			1,450	0	0	....				1,450	0	0
Hawkesbury Agricultural College Egg Laying Competition Prize Fund		364	15	3	1,067	18	0	931	15	6		500	17	9
Legume Inoculant Association Contribution towards Research and Service in the field of Rhiziobiology		2	14	6	....			....				2	14	6
McGarvie Smith Institute—Contribution towards facilities for Glenfield Veterinary Research Station		....			500	0	0	187	17	6		312	2	6
Manning District Agricultural Research Council Contribution for Pasture Research in the Manning District	*Dr.*	6	1	4	1,877	2	0	2,228	1	5	*Dr.*	357	0	9

Special Deposits Account—*continued*

Name of Account	Balance as at 1st July, 1964	Receipts 1964-65	Payments 1964-65	Balance as at 30th June, 1965
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Overseas Visit—W. T. Atkinson, Agronomist	....	333 0 0	333 0 0	....
Overseas Visit—R. L. Colman, Agronomist	....	1,852 10 0	1,786 2 2	66 7 10
Pender W.S. Memorial Fund—Interest on Bonds	46 2 0	59 12 11	5 0 0	100 14 11
Reserve Bank of Australia Grant from Rural Credits Development Fund for Dairy Farm Development on Alluvial and Chocolate Basalt Soils in Richmond Valley	....	2,051 0 0	917 8 0	1,133 12 0
Reserve Bank of Australia Grant from Rural Credits Development Fund towards Whole Farm Feed Year Studies	17 5 0	1,030 0 0	1,297 10 6	*Dr.* 250 5 6
Rice Research Laboratory, Yanco	22 10 0	....	....	22 10 0
Shannon Vale Nutrition Station Working Account	13,434 10 3	9,507 14 0	5,186 17 1	17,755 7 2
The Sulphur Institute of U.S.A. Grant for Compilation, etc., of Results of U.P.S.E.T. Trials	1,284 4 10	....	441 5 3	842 19 7
Tobacco Extension Grant to Finance Additional Extension Work	3,867 16 7	....	1,931 19 0	1,935 17 7
Tropical Fruit Research Station—Donation by Banana Grower's Federation	2,769 18 11	....	429 18 3	2,340 0 8
Unclaimed Salaries and Wages	192 19 11	1,650 8 8	906 17 7	936 11 0
Wheat Industry Research Committee of New South Wales Grant—Breeding of Improved Wheat Varieties for Irrigation Areas	832 14 5	1,800 0 0	2,321 14 6	310 19 11
Cropping Trial	152 2 4	....	152 2 4	....
Expanded Wheat Research Projects, Wagga Agricultural Research Institute—Agronomic Survey	647 8 10	8,005 0 0	7,293 13 1	1,358 15 9
Genetic Analysis of Physiological Components of Maturity of Wheat	299 8 7	1,200 0 0	1,712 9 9	*Dr.* 213 1 2
Glasshouse for Cytogenetic Investigations	....	4,000 0 0	3,508 0 0	492 0 0
Insulation and Refrigeration of Cold Room and Heating of Glasshouse, Tamworth	1,068 0 0	....	697 10 0	370 10 0
Investigation of Black Soil Scarab	394 4 2	....	378 18 0	15 6 2
Laboratory Equipment, Wagga Agricultural Research Institute	1,500 0 0	2,102 2 2	2,822 10 8	779 11 6
Mechanism of Frost Resistance in Wheat	218 6 5	....	162 11 0	55 15 5
Purchase of Brabender Quadrumat Junior Mill	120 6 5	....	120 6 5	....
Purchase of Solarimeter	....	200 0 0	....	200 0 0
Skeleton Weed Research	1,096 3 2	....	691 7 11	404 15 3
Soft Wheat Quality Programme—Central West	2,288 9 2	....	1,012 18 2	1,275 11 0
Soil Fertility	74 18 3	1,600 0 0	1,179 2 4	495 15 11
Temperature Control in Glasshouse, Tamworth	....	2,300 0 0	....	2,300 0 0
Temperature Controlled Growth Chamber	....	2.000 0 0	....	2 000 0 0
Travel and Capital Expenditure—Dr. A. T. Pugsley and G. M. Halloran	736 8 3	....	520 14 5	215 13 10
Visit to New Zealand of a Soil Chemist	7 10 5	....	....	7 10 5
Wheat Breeding—Temora	....	900 0 0	700 0 0	200 0 0
Wheat Granularity	137 3 7	....	137 3 7	....
Wheat Research in the Central West	*Dr.* 1,299 11 3	16,000 0 0	13,905 18 11	794 9 10
Wheat Yield	192 9 10	....	192 9 10	....
Wheat Industry Research Council Grant—Capital Grant for Extensions, Agricultural Research Institute, Wagga	....	8,000 0 0	....	8,000 0 0
Economics of Segregation and Storage of Wheat	....	1,425 0 0	647 3 4	777 16 8
Improvement of Durum Wheat Varieties	....	675 0 0	576 13 0	98 7 0
Investigation into possibilities of Segregation of Wheats on the basis of Quality—Wheat Grading Survey	206 9 3	2,615 0 0	1,704 1 7	1,117 7 8
Photo Period and Temperature Studies	614 6 0	3,588 0 0	3,805 6 5	396 19 7
Tamworth Agricultural Research Station—Equipment	5,000 0 0	....	5,000 0 0	....
World Wheat Collections—Overseas Travel	....	1,250 0 0	1,250 0 0	....
Yellow Dwarf Virus	....	210 0 0	102 9 9	107 10 3
Wool Production Research Advisory Committee Grant—				
Adaptive Pasture Research—Southern Tablelands	185 5 0	5,240 0 0	4,287 7 7	1,137 17 5
Additional Sheep and Wool Advisory Officers	*Dr.* 8 4 4	8 4 4	....	....
Aerial Control of Serrated Tussock—Southern Tablelands	....	1,000 0 0	1,439 1 2	*Dr.* 439 1 2
Comparison of Management Systems	1,275 14 1	1,750 0 0	2,983 8 9	42 5 4
Co-operative Research into Treatment of Non-Arable Areas—Serrated Tussock Control	327 17 8	1,168 0 0	1,191 11 9	304 5 11
Effect of Pasture Management and time of Lambing on Wool and Lamb Production in the S.W. Wheat Belt of New South Wales	....	1,450 0 0	1,413 7 9	36 12 3
Efficiency of Wool Production	741 2 6	6,475 0 0	2,669 11 0	4,546 11 6
Fleece Measurement for Selection of Stud Merino Rams	1,089 16 10	3,500 0 0	4,931 11 9	*Dr.* 341 14 11
Incidence and Prophylaxis of Ewe Infertility due to Sub-Clover Ingestion	....	1,350 0 0	....	1,350 0 0
Influence of Rates of Stocking and Superphosphate Applications on the Productivity of Merino Ewes Grazing Improved Annual Pastures	....	1,000 0 0	832 16 5	167 3 7
Influence of Season on Ram Fertility	*Dr.* 193 12 1	888 0 0	357 19 5	336 8 6
Investigation of Black Soil Scarab	580 2 9	1,200 0 0	1,503 9 10	276 12 11

Special Deposits Account—*continued*

Name of Account	Balance as at 1st July, 1964	Receipts 1964-65	Payments 1964-65	Balance as at 30th June, 1965
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Investigations of Vital Statistics of Yass Valley Merino Flocks	....	1,350 0 0	1,044 18 5	305 1 7
Research into control of Insecticidal Resistance in Sheep Blowfly	339 14 1	1,375 0 0	1,476 14 2	237 19 11
Research into Control of Itch Mite in Sheep	881 4 2	....	899 4 11	*Dr.* 18 0 9
Research in Galvanised Burr Control	449 3 0	....	449 3 0	....
Re-establishment of Shannon Vale Nutrition Station	2,147 7 7	....	2,147 7 7	....
Sheep Breeding and Pasture Management—Relative Efficiency at several stocking rates and Superphosphate Levels	*Dr.* 1,145 13 3	5,539 0 0	4,262 15 4	130 11 5
£	1,154,811 8 7	1,563,076 16 1	1,415,528 9 10	1,302,359 14 10

Brief details of the legislation covering some of the more important aspects of these accounts, together with short histories of the operations conducted under each of them, were given in the Annual Report of 1957-58.

Commonwealth Grant for Science Laboratories and Technical Training

A new Special Deposits Account was opened following the passing of the Commonwealth's "States Grants" (Science Laboratories and Technical Training) Act, 1964, under which £31,620 was provided, for 1964-65, for the construction of buildings and purchase of equipment essential to them.

Of the total grant £5,202 5s. 2d. was spent in the financial year to 30th June, 1965 at Hawkesbury Agricultural College for a Sheep Husbandry Demonstration Room and technical equipment. The unspent balance has been committed for the purchase of scientific and technical equipment at Hawkesbury Agricultural College and extension of the Biological Section classrooms and construction of a Library at Wagga Agricultural College.

The following additional information is furnished in respect of such of the accounts as appear to warrant further amplification:—

Swine Compensation Fund

	£ s. d.
Balance as at 1st July, 1964	43,105 8 6
Receipts—	
Stamp Duty	63,878 0 0
	£106,983 8 6
Payments—	
Swine Compensation	6,511 3 8
Balance as at 30th June, 1965	£100,472 4 10

Cattle Compensation Fund

Disease	Claims			Animals			Payments		
	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total
							£ s. d.	£ s. d.	£ s. d.
Tuberculosis	1,404	602	2,006	3,590	962	4,552	67,878 11 10	29,262 9 2	97,141 1 0
Cancer	3,717	448	4,165	5,220	549	5,769	68,647 0 9	11,726 8 10	80,373 9 7
Actinomycosis	2,382	13	2,395	2,787	13	2,800	34,935 14 5	183 7 3	35,119 1 8
Actinobacillosis	1,180	6	1,186	1,489	6	1,495	15,410 0 9	78 8 4	15,488 9 1
Pleuro Pneumonia Contagiosa	1	..	1	1	..	1	35 0 0	....	35 0 0
Trichomoniasis	1	..	1	1	..	1	16 11 1	....	16 11 1
Tick Fever	72	..	72	216	..	216	4,132 17 11	....	4,132 17 11
Johne's Disease	1	..	1	1	..	3	43 15 0	....	43 15 0
Vibriosis	..	..	..	..	..	..	....	....	....
Totals	8,758	1,069	9,827	13,305	1,530	14,835	£191,099 11 9	41,250 13 7	£232,350 5 4

SUMMARY OF RECEIPTS AND PAYMENTS

	£ s. d.	£ s. d.	£ s. d.
Balance of Fund as at 1st July, 1964	......	......	£727,912 13 2
Add Receipts—			
Levy		202,778 1 4	
Sale of Stamps		102,466 3 9	
Refund Overpayments		95 1 6	305,339 6 7
			£1,033,251 19 9
Deduct Payments—			
Compensation		232,350 5 4	
Administration Costs—			
Valuation Fees	18 18 0		
Cartage –Suspects	23 8 0		
Allowances to Secretaries Pastures Protection Boards	2,394 0 0		
Department of Agriculture	13,021 0 0	15,449 16 0	247,807 11 4
Balance of Fund at 30th June, 1965	......	......	£785,444 8 5

Commonwealth Dairy Industry Extension Grant

The agreement for the continuance of this grant, terms and conditions of which were set out in the Department's Report for the year ended 30th June, 1953, expires on 30th June, 1968.

The first grant was received in October, 1948, and expenditure to 30th June, 1965, amounted to £1,129,848 10s. 8d., details of which are set out hereunder:—

Item	1948-49 to 1963-64	1964-65	Total
	£ s. d.	£ s. d.	£ s. d.
Organising Officers	174,071 11 0	14,983 16 9	189,055 7 9
General Publicity	101,527 5 7	12,014 0 1	113,541 5 8
Demonstrations	177,265 19 4	8,137 1 6	185,403 0 10
Competitions	7,437 7 4	....	7,437 7 4
Field Days	88 15 7	....	88 15 7
Herd Recording	330,283 17 10	33,230 10 8	363,514 8 6
Artificial Insemination	60,075 15 3	....	60,075 15 3
Statistical Work	18,034 1 9	....	18,034 1 9
Herd Surveys	26,165 6 8	....	26,165 6 8
Punch Card Equipment	31,824 4 11	1,444 4 3	33,268 9 2
Milking Machine Survey	50,915 18 3	11,493 13 9	62,409 12 0
Milking Machine Testing Station	4,882 14 5	....	4,882 14 5
Survey—Infertility in Dairy Herds	11,121 16 1	....	11,121 16 1
Agricultural Trainees	33,000 0 0	7,000 0 0	40,000 0 0
Sire Survey	4,164 15 5	840 18 9	5,005 14 2
Testing Stations—Air Flow Meters	186 10 4	62 11 9	249 2 1
Overseas Visits—Departmental Officers	4,625 16 5	1,969 17 0	6,595 13 5
Publication of Book "Weeds"	3,000 0 0	....	3,000 0 0
£	1,038,671 16 2	91,176 14 6	1,129,848 10 8

Commonwealth Grant—Expansion Agricultural Advisory Services, of N.S.W.

The Commonwealth agreed to make grants to the States to permit of the expansion of the Agricultural Advisory Services. The agreement terminated on 30th June, 1965. Arrangements have been made for the grants to continue for a further year, to 30th June, 1966, on the same basis as previously.

Expenditure from the commencement of the agreements to 30th June, 1965, is shown below:—

Item	1952-53 to 1963-64	1964-65	Total
	£ s. d.	£ s. d.	£ s. d.
Crop and Pasture Demonstrations	91,867 1 11	652 0 1	92,519 2 0
Livestock Demonstrations	32,415 12 9	1,994 14 8	34,410 7 5
Horticultural Demonstrations	18,408 6 11	1,808 19 7	20,217 6 6
Agricultural Machinery Demonstrations	33,414 10 2	5,939 2 0	39,353 12 2
Irrigation Equipment and Demonstrations	1,100 16 5	....	1,100 16 5
Field Assistants and Motor Vehicles	260,255 2 3	33,160 19 11	293,416 2 2
Extension Aid Equipment	49,406 16 6	618 7 3	50,025 3 9
Publicity Officers	127,430 5 9	23,928 2 5	151,358 8 2
Production of Agricultural Publications	38,964 13 9	558 13 6	39,523 7 3
Production of Agricultural Films	2,870 17 1	....	2,870 17 1
Purchase of Books	11,312 15 9	1,237 0 3	12,549 16 0
Overseas Visits of Agricultural Officers	9,661 6 8	....	9,661 6 8
Agricultural Trainees and Cadets	70,899 19 2	7,411 14 2	78,311 13 4
Administration	10,913 10 5	1,335 9 5	12,248 19 10
Water and Soil Testing	5,400 18 2	453 9 0	5,854 7 2
Totals £	764,322 13 8	79,098 12 3	843,421 5 11

Noxious Insects Destruction Account

The Noxious Insects Act of 1934 provides for the striking of a levy under specified conditions, as a contribution towards the cost of suppression and destruction of noxious insects. Receipts are paid into Special Deposits Account and the moneys to the credit of the account are applied by the Minister for the purposes prescribed by the Act.

Following an outbreak of plague locust, in 1963-64, a levy was struck to finance operations to combat the outbreak. An advance of £50,000 from the Treasury, pending striking of the levy, has been repaid.

The 1964-65 statement of receipts and payments is as under:—

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.
Sale of Materials	658	6	11	Repayment Treasury Advance	50,000	0	0
Levies	81,243	4	5				
Refund Overpayment	140	6	9	Poisons, Materials and Sundry Purchases	35,045	8	3
	82,041	18	1	Storage Sheds	3,752	0	0
Balance at 1st July, 1964	53,799	18	9	Utility Truck	821	1	6
				Contribution toward Salary and Expenses of Patrol Officer—Grasshopper Control	2,590	0	0
					92,208	9	9
				Balance at 30th June, 1965	43,633	7	1
	£135,841	16	10		£135,841	16	10

Potato Growers' Licensing Act, 1940 (as amended)

Transactions on this account for the year 1964-65 were:—

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.	£	s.	d.
Balance at 1st July, 1964	944	12	3	Grants to Potato Growers' Association				1,800	0	0
Licence Fees	1,456	2	6	Printing				19	2	7
				Administrative Costs (1963-64)—						
				Licences	89	10	0			
				Postage	98	9	1			
								187	19	1
				Balance 30th June, 1965				393	13	1
	£2,400	14	9					£2,400	14	9

Shannon Vale Nutrition Station—Working Account

The following is the statement of receipts and payments for the year ended 30th June, 1965:—

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.
Balance at 1st July, 1964	14,047	10	3	Wages	1,663	9	9
				Shearing	413	4	8
Sale of Wool	8,454	13	5	Workers Compensation Insurance	10	7	1
				Payroll Tax 1963-64	35	15	7
Sale of Sheep and Skins	1,053	0	7	Freight and Cartage	454	7	4
				Motor Fuel	69	1	6
				Vaccines and Drenches	398	13	7
				Road Works	121	11	2
				Toilet Building	313	5	0
				Extension Shearing Shed	519	6	8
				Purchase of Sheep	1,438	8	0
				Plant Maintenance and Repairs	87	15	3
				General Supplies	274	11	6
				Balance at 30th June, 1965	17,755	7	2
	£23,555	4	3		£23,555	4	3

OTHER ACCOUNTS

Contribution by Milk Board to meet cost of Herd Testing for Tuberculosis

Although these operations are within the framework of the Consolidated Revenue Fund, separate accounts are kept in the Department to show the annual financial result. Following is a Statement of receipts and payments for the year ended 30th June, 1965, in respect of this service:—

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.
				Balance at 1st July, 1964	113	0	7
Contributions by Milk Board	5,293	0	7	Salaries	4,582	17	8
Balance at 30th June, 1965	268	10	11	Employer's Proportion of Superannuation Contributions	519	1	1
				Workers' Compensation Insurance Premium	63	9	2
				Payroll Tax	118	3	5
				Travelling Expenses	143	18	1
				Printing	16	1	6
				Postage	5	0	0
	£5,561	11	6		£5,561	11	6

Veterinary Surgeons' Act, No. 25 of 1923 as amended

The Act provides for the establishment of a Board to be called " Board of Veterinary Surgeons of New South Wales ". Fees and penalties collected under the Act are paid to the credit of Consolidated Revenue Fund, from which administrative expenses of the Board are met. There were 527 registered Veterinary Surgeons at 30th June, 196.5

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.
Registration Fees	51	9	1	Salaries	717	10	2
Roll Fees	1,134	8	3	Members' Fees	172	4	0
Examination Fees	31	10	0	Travelling Expenses	20	5	2
Excess of Payments over Receipts	9	5	10	Postal Expenses	41	19	9
				Printing	273	7	5
				Minor Expenses	1	6	8
	£1,226	13	2		£1,226	13	2

Meat Inspection Service

This service is administered under the Meat Industry Act, 1915, as amended, which makes provision for inspection fees.

Following is a statement of receipts and payments on behalf of the Meat Inspection Service for the year ended 30th June, 1965:—

RECEIPTS	£	s.	d.	PAYMENTS	£	s.	d.
Inspection Fees—				Salaries and Wages	335,037	5	1
Regulation No. 7	243,540	19	11	Casual Labour	4,354	16	7
Regulation No. 8	44,518	2	0	Retirement Leave	4,486	3	4
Regulation No. 9	145,366	19	8	Metropolitan Meat Industry Board Officers' Endowment Fund Contribution	2,651	1	4
Regulation No. 10	4,626	8	9	Travelling Expenses	26,725	17	1
				Freight and Cartage	48	8	4
				Books, Periodicals and Papers	65	17	11
				Postal and Telephone Expenses	533	9	4
				General Stores	1,471	2	8
				Gas and Electricity	23	9	10
				Rent	467	0	0
				Printing	290	19	1
				Surplus of Receipts over Payments	61,896	19	9
	£438,052	10	4		£438,052	10	4

While there was a surplus of £61,896 19s. 9d. of receipts over payments, overhead expenses amounting to £67,878 8s. 4d. have not been taken into account. These include employer's superannuation contribution, workers' compensation insurance, and payroll tax, calculated at 20 per cent of cost of salaries and wages (£339,392 1s. 8d.). Applying this figure results in a deficiency of £5,981 8s. 7d. This amount can be increased by £26,316 3s. 5d., the amount by which payments by the Metropolitan Meat Industry Board for 1964-65 exceeded the actual debits for that year.

Fund Created by Wheat Marketing (Barring of Claims) Act No. 22 of 1929 (as amended)

REVENUE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1965

	£	s.	d.		£	s.	d.
To Miscellaneous Disbursements	1,556	0	0	By Interest on Investments (including Savings Bank Interest)	2,314	17	2
Commitments Disbursements	600	0	0				
Balance—Net Surplus transferred to Accumulated Funds Account	158	17	2				
	£2,314	17	2		£2,314	17	2

BALANCE SHEET AS AT 30TH JUNE, 1965

LIABILITIES	£	s.	d.	£	s.	d.	ASSETS	£	s.	d.
Accumulated Funds—							Investments in Government Securities (face value)	46,800	0	0
Balance as at 1st July, 1964	46,803	1	7				Balance in Savings Bank	297	19	2
Net surplus for year ended 30th June, 1965	158	17	2				Interest accrued at 30th June, 1965	463	19	7
				46,961	18	9				
Commitments as at 30th June, 1965				600	0	0				
				£47,561	18	9		£47,561	18	9

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND—FINANCIAL YEAR 1964-65

Head of Receipt	Net Receipts		
	£ s. d.	£ s. d.	£ s. d.
Receipts for Services Rendered—			
Agricultural Colleges and Farms—			
Rents	28,548 18 3		
Students' Fees	74,594 10 1		
		103,143 8 4	
Fees—			
Public Officers	18 1 0		
Apiary Registrations	2,693 17 9		
Grading—Dairy Industry Act	456 11 11		
Licence—Dairy Industry Act	37 5 6		
Registration—Dairy Industry Act	19 0 0		
Dairy Science Schools	683 4 6		
Farm Produce Agents' Act, 1926-1932	297 0 0		
Fertilizer Act, 1934	785 5 0		
Pest Destroyers Act, 1945	1,914 1 6		
Registration of Stock Brands	2,433 15 8		
Registration of Swine Brands	140 18 7		
Stock Foods and Medicines Act, 1940	3,892 17 2		
Veterinary Surgeons' Act, 1923	1,217 7 4		
		14,589 5 11	
Contributions—			
Milk Board—T.B. Testing of Herds	5,298 4 6		
Commonwealth Government—Administration of Plant Quarantine	68,628 6 7		
Commonwealth Government—Administration of Animal Quarantine	28,011 18 4		
Commonwealth Government—Administration of Commerce Act	34,332 9 4		
Commonwealth Government—Maintenance of Gardens at Admiralty House	7,780 16 3		
		144,051 15 0	
Miscellaneous Services Rendered—			
Plant Diseases Act—Inspection Fees and Fumigation Fees	450 14 2		
Meat Industry Act—Inspection Fees	438,052 10 4		
Commonwealth Scientific and Industrial Research Organisation—Subsidy—Vegetable growing at Hawkesbury Agricultural College	500 0 0		
Laundry Fees—Hawkesbury Agricultural College	3,518 6 8		
Certification of Seed	12,480 1 4		
Seed Testing	259 18 0		
Herd Recording	69,171 5 0		
Administration of Cattle Compensation Fund	13,021 5 0		
Commission for Collection of Premiums—Group Assurance Hospitals and Medical Funds	1,887 0 3		
Other Miscellaneous Receipts	29,155 10 1		
		568,496 10 10	
			830,281 0 1
General Miscellaneous Receipts—			
Rents exclusive of Land	3,759 10 0		
Fines and Forfeitures—Forfeiture of Bonds, &c.	3,600 15 0		
Sales of Farm Produce—Farms and Institutions	181,495 6 9		
Sale of Government Property	866 16 4		
Commonwealth Government—Contribution for Cattle Tick Control	206,828 0 0		
Repayments to credit of Consolidated Revenue Funds—Previous Years	21,088 12 11		
Miscellaneous Receipts on Account of Interest	127 0 11		
Transfer of Part Balances not required	5 5 6		
Licence Fees—Pastures Protection Act	1 0		
Broadcasting Fees	25 11 7		
Gas and Electricity	3,778 2 0		
Lavatory Takings	146 15 6		
Postages	45 2 5		
Telephone Calls (private)	1,407 16 3		
3% Contribution—Pastures Protection Boards	25,919 10 1		
Employer's Liability to State Superannuation Fund	2,103 17 4		
Commonwealth Grant towards Cost of Herd Recording	33,230 10 8		
Other Miscellaneous Receipts	492 19 4	484,921 13 7	
			484,921 13 7
Total Net Receipts £	....	....	1,315,202 13 8

DAIRY PRODUCTS FACTORY—HAWKESBURY AGRICULTURAL COLLEGE

The operations of the Dairy Products Factory during the financial year 1964-65 resulted in a loss of £2,371 0s. 6d. Abridged final accounts are set out hereunder:—

Manufacturing and Trading Account

	£	s.	d.		£	s.	d.
Stock on hand at 1st July, 1964	3,151	11	8	Sales	166,826	19	0
Purchases	130,200	19	2	Sundry Other Income	96	17	0
Repairs and Maintenance	4,360	9	1	Stocks on hand at 30th June, 1965	820	4	7
Fuel, Light and Power	4,230	4	10				
Water	1,252	2	6				
Salaries and Wages	8,880	17	3				
Workers' Compensation Insurance Premiums	132	2	1				
Payroll Tax	218	10	2				
Superannuation—Employer's Liability	1,074	17	8				
Depreciation	10,181	3	11				
Sundry Expenditure	190	10	6				
Gross Profit	3,870	11	9				
	£167,744	0	7		£167,744	0	7

Profit and Loss Account

	£	s.	d.		£	s.	d.
Salaries and Wages	3,978	10	3	Gross Profit from Manufacturing and Trading Accounts	3,870	11	9
Payroll Tax	97	17	9	Sundry Income	19	7	9
Workers' Compensation Insurance Premium	59	3	7	Net Loss	2,371	0	6
Levies—Butter and Cheese	205	6	9				
Superannuation—Employer's Liability	233	9	8				
Printing and Stationery	60	16	9				
Freight and Cartage	294	6	0				
Laboratory Expenses	166	5	4				
Repairs and Maintenance	229	13	5				
Telephone	135	18	6				
General Expenses	149	4	1				
Depreciation	650	7	11				
	£6,261	0	0		£6,261	0	0

Appropriation Account

	£	s.	d.		£	s.	d.
Loss on Disposal of Plant	494	0	0	Balance at 1st July, 1964	24,425	8	4
Loss of Bottle Deposits Previous Years	1,210	6	6	Equalisation step up	5,000	0	0
Water Rates 1963-64	1,222	12	6	Expenditure not met from Working Account (power, water, detergents, &c.)	2,951	1	7
Net Loss 1964-65	2,371	0	6				
Balance at 30th June, 1965	27,078	10	5				
	£32,376	9	11		£32,376	9	11

APPENDIX II

Published Matter*, 1964-65

*Viz.:—Matter printed as Department of Agriculture (D. of A.) booklets, or contributed to and printed as articles either in Department of Agriculture journals (the monthly *Agricultural Gazette of N.S.W.*, quarterly *Review of Marketing and Agricultural Economics*, bi-monthly *Dairy Topics*, monthly *Poultry Notes*, the periodical *Research and the Farmer*) or the journals of other institutions/organisations; and papers published in the proceedings of technical conferences.

The Appendix does not list the many times greater volume of items contributed in the course of extension work through such channels as the Department's weekly printed *Press Copy*, and the regional/district publicity releases for newspapers and radio stations. Indications of the volume of this published matter are included in this report under "Division of Information Services" and "Regional Extension Services".

A. RESEARCH STATIONS BRANCH—FARM MECHANISATION ADVISORY SERVICE

D. of A. Booklets

Drever, J. G. J.—Buckrakes—features and uses. (Bulletin 50.)

Drever, J. G. J.—The farm mower—care and maintenance. (Bulletin 32.)

Drever, J. G. J.—Grain augers—types, features, recent research. (Bulletin 52.)

Drever, J. G. J.—How many acres per hour? (Bulletin 46.)

Drever, J. G. J. and Atkinson, J. A.—Winter management of farm vehicles. (Bulletin 51.)

Contributions to Journals

Drever, J. G. J. (1965)—Avoid overheated engines. Agric. Gaz. N.S.W. 76 (1): 37.

Drever, J. G. J. (1964)—Buckrakes—features and uses. Agric. Gaz. N.S.W. 75 (7): 1130-4.

Drever, J. G. J. (1964)—Check fire fighting machinery now. Agric. Gaz. N.S.W. 75 (9): 1281.

Drever, J. G. J. (1964)—Makeshift tractor starting dangerous. Agric. Gaz. N.S.W. 75 (7): 1148.

Drever, J. G. J. (1964)—Order spare parts now. Agric. Gaz. N.S.W. 75 (8): 1215.

Drever, J. G. J. (1964)—Preventing accidents on the farm. Agric. Gaz. N.S.W. 75 (6): 1082-6.

Drever, J. G. J. (1965)—Selecting a Chain Saw. Agric. Gaz. N.S.W. 76 (4): 194-9.

Drever, J. G. J.—Tractors feel the cold. Agric. Gaz. N.S.W. 76 (6): 363.

Drever, J. G. J. (1964)—Window space should be featured in planning new farm machinery building. Agric. Gaz. N.S.W. 75 (8): 1211.

Drever, J. G. J. (1965)—Your chain saw—how to use it safely and keep it working well. Agric. Gaz. N.S.W. 76 (5): 266-72.

Finlayson, W. H. and Drever, J. G. J. (1965)—Systematic Maintenance of farm machinery. Agric. Gaz. N.S.W. 76 (6): 340-5.

B. DIVISION OF PLANT INDUSTRY

D. of A. Booklets

Anon.—Rhubarb Growing. (Bulletin p. 278.)

Filan, F. F.—Lucerne—The King of Fodders. (Bulletin P. 233.)

Filan, F. F.—Management of pastures for seed production. (Bulletin P. 236.)

Fitzsimmons, R. W.—Cultivation of rye. (Bulletin P. 67.)

Contributions to Journals

Anon. (1964)—Grow your own herbs. Agric. Gaz. N.S.W. 75 (9): 1301-3.

Anon. (1964)—Serving agriculture—Grafton Agricultural Research Station. Agric. Gaz. N.S.W. 75 (11): 1378-84.

Bagshaw, F. A. (1965)—Cyclamen culture. Agric. Gaz. N.S.W. 76 (1): 54-7.

Bird, J. G. and Swain, F. G. (1964)—A note on a whole farm "feed year" project. Review of Marketing and Agricultural Economics 32 (2): 81-87.

Boyle, A. J. (1965)—Agricultural airstrips—catering to a growing need. Agric. Gaz. N.S.W. 76 (2): 66-70.

Boyle, J. W. (1964)—Maize yields can be increased. Agric. Gaz. N.S.W. 75 (11): 1409-11.

Boyle, J. W. (1964)—Rapid changeover to hybrid sorghums. Agric. Gaz. N.S.W. 75 (10): 1355-6.

Bradley, J. and Fitzsimmons, R. W. (1964)—Wheat uniform fertilizer trials in New South Wales, 1959-61. Agric. Gaz. N.S.W. 75 (12): 1487-97.

Campbell, M. H. (1964)—Two trials of aerial techniques for the control of serrated tussock. Agric. Gaz. N.S.W. 75 (12): 1442-50.

Campbell, M. H. and O'Dwyer, T. A. (1964)—The carry boom. Agric. Gaz. N.S.W. 75 (8): 1191-4.

Colman, R. L. (1964)—Nitrogen fertilization of *Paspalum dilatatum* Poir. in relation to the feed requirements of dairy cattle on the north coast of N.S.W. M.Sc.Agr. Thesis, University of Sydney, March, 1964.

Colman, R. L. (1964)—Root knot nematodes as a cause of poor growth of clover on the far north coast of N.S.W. Agric. Gaz. N.S.W. 75 (10): 1367-8.

Decker, A. M., Retzer, H. S. and Swain, F.G. (1964)—Improved soil openers for the establishment of small seeded legumes in sod. Agron. Jour. 56: 211-214.

Esdaile, R. J. (1965)—Wheat fertilizer trends in Northwestern N.S.W. Agric. Gaz. N.S.W. 76 (3): 155-9.

Evans, L. H. (1965)—Superphosphate reduces swede turnip germination. Agric. Gaz. N.S.W. 76 (5): 302-3.

Fitzsimmons, R. W. (1964)—Disease and frost damage to cereal crops 1963-4. Agric. Gaz. N.S.W. 75 (10): 1346-50.

Gottl, R. (1965)—College gold. Agric. Gaz. N.S.W. 76 (3): 152-4.

Hodge, P. H. (1965)—Artificial drying of wheat. Agric. Gaz. N.S.W. 76 (4): 213-6.

Holder, J. M., and McBarron, E. M. (1964)—The production of kikuyu grass silage and its palatability to dairy stock. Proc. Aust. Soc. An. Prod. 5: 332.

Hudson, W. J., Gilbert, W.S., Swain, F. G., Braithwaite, B.M., and Annette Jane (1964)—Residues in milk and body fat of cattle grazed on pastures treated with dieldrin. Aust. J. Exp. Agric. An. Husb., 4 (13): 107-11.

Hudson, W. J. C., Swain, F. G., Holder, J. M., Colman, R.L., and Bird, J.G. (1965)—Development and evaluation of pasture for dairy cattle in a subtropical environment. Proc. 9th int. Grass Cong. Brazil, 1965.

Imrie, B. C. (1964)—Rainfall distribution governs time of sowing of grain sorghum. Agric. Gaz. N.S.W. 75 (12): 1475-7.

Jessup, R. J. (1964)—Growing capsicums (peppers). Agric. Gaz. N.S.W. 75 (10): 1357-60.

Komoll, R. F. (1965)—Temporary Grain Storage. Agric. Gaz. N.S.W. 76 (6): 327-31.

Leggett, E. K. (1965)—ANFO—A new explosive for use in agriculture. Agric. Gaz. N.S.W. 76 (1): 2-8.

Macadam, R. D. and Noonan, J. B. (1965)—Anhydrous ammonia—a new nitrogenous fertilizer. Agric. Gaz. N.S.W. 76 (2): 71-7.

Mackenzie, F. D. (1965)—Yanco Agricultural College and Research Station. Agric. Gaz. N.S.W. 76 (5): 258-65.

Mears, A. D. (1964)—An ounce of prevention may save a ton of cotton. Agric. Gaz. N.S.W. 75 (11): 1399-1402.

Mears, A. D. (1964)—Rabbit destruction the key to control of Darling pea. Agric. Gaz. N.S.W. 75 (12): 1468-70.

Mears, A. D. (1964)—Tordon—Herbicide with a future. Agric. Gaz. N.S.W. 75 (9): 1282-3.

Mears, A. D. (1965)—Wild oats—poor relations in wheat. Agric. Gaz. N.S.W. 76 (5): 287-92.

Mears, P. T., Murtagh, G. J., and Wilson, G. P. M. (1964)—Silverleaf Desmodium. Agric. Gaz. N.S.W. 75 (10): 1332-35.

O'Reilly, J. A. (1964)—A place for winter wheats in the north-west. Agric. Gaz N.S.W. 75 (7): 1142-3.

Perry, T. R., and Mears, A. D. (1964)—Controlling African boxthorn with Fenuron. Agric. Gaz. N.S.W. 75 (8): 1201-3.

Sumeghy, J. B. (1965)—The effect of temperature on yield and continuity of fruit supply of direct seeded and transplanted tomatoes. Agric. Gaz. N.S.W. 76 (5): 309-13.

Swain, F. G., and Bird, J. G. (1964)—Agronomic and economic planning of an improved farming system in a sub-tropical dairying area. Thirty-seventh A.N.Z.A.A.S. Congress Section K—Canberra 1964.

Swain, F. G., and Hudson, W. J. C. (1964)—A gradient seeder for species establishment and production studies. Aust. J. Exp. Agric. An. Husb., 4 (14): 217-21.

Walkden-Brown, C. (1965)—Features of the 1964-5 wheat season. Agric. Gaz. N.S.W. 76 (6): 357-60.

Walkden-Brown, C. (1964)—Wheat—looking ahead. Agric. Gaz. N.S.W. 75 (11): 1390-4.

Walkden-Brown, C., and Fitzsimmons, R. W. (1964)—Frost—wheatgrowers' enemy No. 1. Agric. Gaz. N.S.W. 75 (9): 1250-5.

Walkden-Brown, C., and Fitzsimmons, R. W. (1965)—Oat variety recommendations for 1965. Agric. Gaz. N.S.W. 76 (1): 27-36.

Walkden-Brown, C., and Fitzsimmons, R. W. (1964)—Wheat variety recommendations for 1965. Agric. Gaz. N.S.W. 75 (12): 1451-4.

Walkden-Brown, C., and Fitzsimmons, R. W. (1965)—Wheat variety recommendations for 1965. Agric. Gaz. N.S.W. 76 (2): 93-104.

Wilson, G., and Barkus, B. (1965)—Sub-tropical grasses for grazing. Agric. Gaz. N.S.W. 76 (4): 222-5.

C. DIVISION OF HORTICULTURE

D. of A. Booklets

Anon.—Growing passion fruit. (Bulletin H65.)

Cann, H. J.—How cold weather affects banana growing in N.S.W. (Bulletin H146.)

Cann, H. J., and Sproule, R. S.—Some Tropical Fruits. (Bulletin H134.)

Davison, J. A.—Prevention of frost damage in orchards and vineyards. (Bulletin H15.)

Fuller, E. J.—Efficient operation of a fruit packing shed. (Bulletin H133.)

Gane, W. B.—Fruitgrowing in New England. (Bulletin H135.)

Horth, C. J.—Fruitgrowing on the Southern coastal slopes and Southern Tablelands. (Bulletin H143.)

McGillivray, K. D.—Fruitgrowing in the Gosford-Wyong District. (Bulletin H136.)

McGrath, J.—Fruitgrowing in the Metropolitan District. (Bulletin H138.)

Robinson, P. W., and Sproule, R. S.—An easy way to make pineapple planter. (Bulletin H132.)

Skepper, A. H.—Pruning leaders of young pear trees. (Bulletin H137.)

Sproule, R. S.—Marcottage as a means of plant propagation. (Bulletin H144.)

Stannard, M. C., and Turpin, J. W.—Biennial pruning lifts prune yields and cuts costs. (Bulletin H139.)

Stone, J.—Soil Management in Tablelands deciduous fruit orchards. (Bulletin H145.)

Sweedman, R.—Fruitgrowing in the Young District. (Bulletin H147.)

Contributions to Journals

Anon. (1964)—Table grapes improved by thinning. Agric. Gaz. N.S.W. 75 (10): 1354.

Austen, V. C. (1964)—The pollination of pecan nuts. Agric. Gaz. N.S.W. 75 (7): 1164-5.

Cann, H. J. (1965)—The macadamia—Australia's own nut. Agric. Gaz. N.S.W. 76 (2): 78-84.

Chalker, F. C. (1965)—Avocado growing on the North Coast. Agric. Gaz. N.S.W. 76 (6): 364-8.

Hall, E. G. and Scott, K. J. (1964)—Cool storage of pears. Agric. Gaz. N.S.W. 75 (8): 1216-21.

Johnson, J. F. (1965)—Developments in orchard spraying machinery. Agric. Gaz. N.S.W. 76 (4): 226-32.

Leggo, D., Gellatley, J. G., Seberry, J. A., Peggie, I. D., Long, J. K. and Hall, E. G. (1965)—Post-harvest sterilization of oranges against Queensland fruit fly. Agric. Gaz. N.S.W. 76 (5): 274-8.

Leggo, D. and Seberry, J. A. (1964)—Ammonia fumigation for reducing green mould wastage in oranges during ethylene degreening. Aust. J. Exp. Agric. An. Husb., 4 (13): 173-7.

Leggo, D. and Seberry, J. A. (1964)—Ammonia reduces mould wastage during ethylene degreening of oranges. Agric. Gaz. N.S.W. 75 (11): 1395-8.

Leggo, D. and Seberry, J. A. (1965)—The effect of diphenyl wraps and case liners on green mould wastage in stored oranges. Aust. J. Exp. Agric. An. Husb. 5 (16): 91-96.

Leggo, D., Seberry, J. A. and Long, J. K. (1964)—Control of stem-end rot in oranges after harvest. Aust. J. Exp. Agric. An. Husb., 4 (14): 247-52.

Levitt, E. C. (1964)—Heavy drop of citrus fruit. Agric. Gaz. N.S.W. 75 (8): 1225-7.

Malcolm, H. D. R. (1965)—The golden queen peach. Agric. Gaz. N.S.W. 76 (3): 143-6.

Malcolm, H. D. R. (1964)—Preston prolific. Agric. Gaz. N.S.W. 75 (9): 1269-72.

Murray, A. F. (1965)—Grapevines yield better with correct spacing. Agric. Gaz. N.S.W. 76 (4): 217-9.

Roberts, E. A., Scott, K. J. and Wills, R. B. H. (1964)—The effects of composition of the atmosphere and the length of storage on the development of brown heart in Williams Bon Chretien pears held in polythene bags. Aust. J. Exp. Agric. An. Husb., 4 (15): 371-5.

Roberts, E. A., Wills, R. B. H. and Scott, K. J. (1965)—The effects of change in concentration of carbon dioxide and oxygen on storage behaviour of Jonathan apples. Aust. J. Exp. Agric. Anim. Husb. 5 (17): 161-165.

Robinson, P. W. and Walsh, M. (1964)—A banana packing table and stand you can make. Agric. Gaz. N.S.W. 75 (10): 1351-4.

Scott, K. J., Hall, E. G., Roberts, E. A. and Wills (1964)—Some effects of the composition of the storage atmosphere on the behaviour of apples stored in polythene film bags. Aust. J. Exp. Agric. Anim. Husb., 4 (14): 253-9.

Skepper, A. H. (1964)—Irrigation needs of fruit trees. Agric. Gaz. N.S.W. 75 (7): 1138-41.

Stannard, M. D. (1965)—Improving canning peach varieties. Agric. Gaz. N.S.W. 76 (1): 17-21.

Sweedman, R. and Fuller, E. J. (1964)—Cherry sorting belts save time and effort. Agric. Gaz. N.S.W. 75 (10): 1336-9.

Turpin, J. W. (1965)—Dareton Horticultural Research Station. Agric. Gaz. N.S.W. 76 (4): 204-9.

Vincent, A. E. (1964)—Spray-irrigated sandhill orchards. Agric. Gaz. N.S.W. 75 (12): 1460-4.

D. DIVISION OF DAIRYING

Contributions to Journals

Anon. (1964)—Cheeses you can make at home. Agric. Gaz. N.S.W. 75 (7): 1176-7.

Barnett, L. G. (1965)—Jill's home easily identified. Dairy Topics. 10 (3): 4-5.

Boutcher, L. G. (1964)—Clay seal beats seepage from north coast dam. Agric. Gaz. N.S.W. 75 (8): 1186-90, 1221.

Bracks, J. M. (1965)—Dairy detergents and sanitisers. Dairy Topics. 10 (2): 4-6.

Bracks, J. M. (1965)—Save time, money, and your legs. Dairy Topics. 10 (3): 3.

Curtin, W. T. (1965)—Sediment Catchment Tank. Dairy Topics. 10(3): 6-7.

Davidson, H. M. (1964)—The Benefits of Herd Recording. Dairy Topics. 9 (6): 8-11.

Heptonstall, D. B. (1964)—Artificial breeding of dairy stock. Dairy Topics. 9 (4): 13-15.

Heptonstall, D. B. (1964)—Evaluating Production Records. Dairy Topics. 9 (6): 3-4.

Laffan, R. T. (1965)—Moveable shed helps rear healthy calves. Dairy Topics. 10 (1): 3-5.

Lattimore, C. W. (1965)—Butter keeping quality. Dairy Topics. 10 (2): 18-21.

Lattimore, C. W. and Short, A. L. (1965)—New device to help produce better butter. Agric. Gaz. N.S.W. 76 (3): 133-6.

Lloyd, G. J. (1964)—Irrigation Dairying. Dairy Topics. 9 (4): 16-22.

Macindoe, A. (1964)—The herd recorder at work. Dairy Topics. 9 (4): 7-8.

McGibbon, J.D.L. (1964)—Organoleptic grading of dairy products. Dairy Topics. 9 (6): 5-7.

McLaren, E. G. (1965)—Flavours in milk and cream. Dairy Topics. 10 (1): 13-17.

Potts, A. K. (1965)—Milk in the Philippines. Dairy Topics. 10 (2): 10-11.

Richardson, A. O. (1965)—Egg counts: A guide to parasite control. Dairy Topics. 10 (1): 6.

Richardson, A. O. (1965)—Silage concentrate from clover. Dairy Topics. 10 (2): 7-9.

Salkeld, J. N. (1964)—Quality Benefits by control of mastitis. Dairy Topics 9 (4): 11-12.

Salkeld, J. N. (1965)—Raw milk refrigeration on dairy farms. Dairy Topics 10 (3): 10-18.

Vernon, F. A. (1964)—Dairying Division's work under the Dairy Industry Act. Dairy Topics 9 (4): 9-10.

Weekes, C. F. (1964)—Antibiotics—your responsibility. Dairy Topics 9 (4): 3-4.

E. DIVISION OF ANIMAL INDUSTRY

Contributions to Journals

Anon. (1965)—Infectious sinusitis—a common disease of turkeys in N.S.W. Agric. Gaz. N.S.W. 76 (4): 237-9.

Anon. (1964)—Keep your pigs free from brucellosis. Agric. Gaz. N.S.W. 75 (8): 1222-4.

Anon. (1965)—Lice of poultry. Poultry Notes. Apr., 9-12.

Anon. (1964)—Pink eye of sheep and cattle. Agric. Gaz. N.S.W. 75 (12): 1478-80.

Anon. (1964)—Standards for judging turkeys in Australia. Agric. Gaz. N.S.W. 75 (7): 1156-9.

Anon. (1964)—Strangles in horses. Agric. Gaz. N.S.W. 75 (7): 1167-8.

Anon. (1964)—Sudden feed change can kill calves. Agric. Gaz. N.S.W. 75 (12): 1467.

Anon. (1964)—Vaccination is insurance against pulpy kidney. Agric. Gaz. N.S.W. 75 (8): 1203.

Benecke, F. S. (1964)—Bees—queen, worker and drone. Aust. Beekeeper. 66: 133.

Benecke, F. S. (1965)—Queen bee banks. Agric. Gaz. N.S.W. 76 (3): 170-1.

Bourke, M. E. (1964)—A comparison of joining systems for prime lamb production. Proc. Aust. Soc. Animal Prod. 5: 129-34.

Bourke, M. E. (1964)—Rates of stocking in prime lamb production. Agric. Gaz. N.S.W. 75 (7): 1135-7.

Charles, G. E. (1965)—First aid for poisoned livestock. Agric. Gaz. N.S.W. 76 (3): 137-42.

Charles, G. E. (1964)—Pseudolipidosis in an Angus vealer. Vet. Inspector. 28: 49-50.

Clark, A. R. (1965)—Dehorning merino rams won't stop poll strike. Agric. Gaz. N.S.W. 76 (4): 210-2.

Clark, N. T. (1965)—A comparison of the reproductive performance of ewes grazing Dwalganup or Bacchus Marsh subterranean clover or a mixture of lucerne and burr medic before and during mating. Aust. J. Exp. Agric. An. Husb. 5 (17): 106-109.

Clemson, A. A. (1964)—Not a threat to bees—1080. Aust. Beekeeper. 66:24.

Clemson, A. A. (1964)—Swarming bees in town areas. Aust. Beekeeper. 66:39.

Cramp, R. C. and Khandekar, V. N. (1964)—Occurrence of earthworms in the wool of sheep. Aust. Vet. J. 40: 268.

Cutts, N. A. (1965)—Sydney Royal Easter Show. Aust. Beekeeper. 66: 247.

Dingle, J. H. P. (1965)—Some activities of the Board of Tick Control laboratory. Agric. Gaz. N.S.W. 76 (4): 233-6.

Diplock, P. D. (1964)—Some observations on neoplasia in meat animals in north-western N.S.W. Vet. Inspector. 28: 67-70.

Douglass, D. S. (1965)—Identify those dry ewes. Agric. Gaz. N.S.W. 76 (1): 13-6.

Douglass, D. S. (1965)—Practical advantages from mulesing at marking. Agric. Gaz. N.S.W. 76 (5): 293-4.

Dun, R. B., Alexander, R. and Smith, M. D. (1964)—Early environment as a permanent influence on the productive performance of sheep. Proc. Aust. Soc. Animal Prod. 5: 141-5.

Dun, R. B. and Douglass, D. S. (1965)—The comparative reproductive performance of polled and horned Merino rams. Aust. J. Exp. Agric. An. Husb. 5 (17): 102-105.

Dun, R. B. and Donelly, F. B. (1965)—The effectiveness of the Mules operation when carried out in conjunction with lamb marking. Aust. J. Exp. Agr. An. Husb. 5 (16): 6-10.

Dun, R. B. (1964)—Skin folds and Merino breeding—1. The net reproductive rates of flocks selected for and against skin fold. Aust. J. Exp. Agric. An. Husb. 4 (15): 376-85.

Eastoe, R. D. (1965)—I keep my wool on—and stay cool. Agric. Gaz. N.S.W. 76 (2): 91.2.

Eastoe, R. D. (1965)—Improved pastures don't pay without more stock. Agric. Gaz. N.S.W. 76 (3): 130-2.

Eastoe, R. D. (1965)—The Shannon Vale Story. Agric. Gaz. N.S.W. 76 (6): 352-6.

Eastoe, R. D. and Luff, A. F. (1964)—Sheep yards—a selection of plans. Agric. Gaz. N.S.W. 75 (12): 1471-4.

Gee, C. D. (1964)—Polio-encephalomalacia in a ewe. Vet. Inspector. 28: 60-1.

Godlee, A. C. (1964)—Twin lambs—what is their value to merino breeders? Agric. Gaz. N.S.W. 75 (9): 1256-60.

Gulliford, J. H. and Minty, R. M. (1965)—Twelfth random sample laying test. Poultry Notes. Jan., 6-14.

Gulliford, J. H. and Turner, J. A. (1965)—Third pure breed's test, Official report. Poultry Notes. Apr., 13-17.

Hartley, W. J. (Univ. Syd.) and Kater, Joan C. (1965)—Diseases of the central nervous system of sheep. Aust. Vet. J. 41: 107-11.

Hartley, W. J. (Univ. Syd.) and Kater, Joan C. (1964)—Perinatal disease conditions in New Zealand. N.Z. Vet. J. 12: 49-57.

Healey, J. S. (1965)—Bloat in cattle. Agric. Gaz. N.S.W. 76 (6): 346-51.

Healey, J. S. (1965)—Eradicating tuberculosis from cattle in N.S.W. Agric. Gaz. N.S.W. 76 (3): 147-51.

Healey, J. S. (1965)—Infectious bronchitis and uroemia in poultry. Poultry Notes. Jan., 2-5.

Healey, J. S. (1965)—Internal parasites of sheep. Agric. Gaz. N.S.W. 76 (5): 279-85.

Healey, J. S. (1965)—Livestock health notes. Agric. Gaz N.S.W. 76 (1): 22-3.

Healey, J. S. (1965)—Livestock Health Notes. Agric. Gaz. N.S.W. 76 (2): 108-9.

Healey, J. S. (1965)—Livestock Health Notes. Agric. Gaz. N.S.W. 76 (3): 160-1.

Healey, J. S. (1965)—Livestock health notes. Agric. Gaz. N.S.W. 76 (4): 220-1.

Healey, J. S. (1965)—Livestock health notes. Agric. Gaz. N.S.W. 76 (5): 300-1.

Healey, J. S. (1965)—Livestock health notes. Agric. Gaz. N.S.W. 76 (6): 361-3.

Hebden, S. P. and Hall, C. A. (1965)—Rametin as an anthelmintic for sheep. Vet. Rec. 77 (8): 207-9.

Holder, J. M. and Kerrigan, R. H. (1964)—Further experience with early weaning of pigs in Australia. Proc. Aust. Soc. Anim. Prod. 5: 135.

Holder, J. M. and McBarron, E. J. (1964)—The production of kikuyu grass (*P. clandestinum*) silage and its palatability to dairy stock. Proc. Aust. Soc. Anim. Prod. 5: 332.

Hotson, I. K. (1964)—Internal parasites of cattle in New South Wales. Vet. Inspector. 28: 45-8.

Kater, Joan C. (1964)—Some observations of the pathology of Swainsona poisoning in sheep, and possible lines of further investigation. Vet. Inspector. 28: 58-9.

Luff, A. F. (1964)—Identification of pure breeding Poll Merinos. Agric. Gaz. N.S.W. 75 (7): 1144-8.

McBarron, E. J. (1964)—Yellow poverty weed in wheat is not toxic for poultry. Poultry Notes. July, 12-14.

McDonald, M. W., Dillon, J. F. and Stewart, D. (1964)—Non-toxicity to poultry of malathion as a grain protectant. Aust. Vet. J. 40: 358-60.

McDonald, M. W. and Duncan, D. C. (1964)—Poultry genetics research at Seven Hills. Poultry Notes. July, 6-11.

McDonald, M. W. and Duncan, D.C. (1964)—The value of complex vitamin mixtures in poultry breeding diets. Poultry Notes. July, 1-5.

McDonald, M. W. and Gulliford, J. H. (1964)—Fifth random sample broiler test. Poultry Notes Oct. 2-8.

Macindoe, R. (1965)—Laying flock replacement programme. Poultry Notes Apr., 6-8.

Macindoe, R. (1964)—The three A's of poultry husbandry. Agric. Gaz. N.S.W. 75 (12): 1465-7.

McInnes, P. and Briggs, P. K. (C.S.I.R.O.) (1964)—The effect of early weaning on the growth rate of crossbred lambs. Proc. Aust. Soc. Anim. Prod. 5: 149.

Nowland, W. J. (1965)—Reducing the effects of stress in poultry. Poultry Notes. Apr., 18-21.

Pattie, W. A. (1964)—Selection for and against weaning weight in Merino sheep. Proc. Aust. Soc. Anim. Prod. 5: 156-9.

Pattie, W. A., Godlee, A. C. and Bouton, P. E. (1964)—The effects of castration and of the poll gene on prime lamb production. Aust. J. Exp. Agric. An. Husb., 4 (15): 386-91.

Randall, M. C. (1964)—Looking after poultry during heat waves. Agric. Gaz. N.S.W. 75 (11)—1414-9.

Restall, B. J. (1964)—The growth and retrogression of the corpus luteum in the ewe. Aust. J. Exp. Agric. An. Husb. 4 (14): 274-76.

Restall, B. J., Fowler, D. G. and Brydon, P. (1965)—The influence of season on the ovulatory activity of Merino ewes slaughtered at a central abattoir. Aust. J. Exp. Agric. An. Husb. 5 (11): 11-12.

Roberts, B. C. (1965)—Merinos—horned or poll? Agric. Gaz. N.S.W. 76 (6): 337-9.

Sheridan, A. K. (1965)—Breeding poultry for disease resistance. Poultry Notes. Apr. 2-5.

Sheridan, A. K. and Thompson, H. S. (1965)—Egg Quality report. Poultry Notes. Apr. 22-7.

Tucker, M. J. (1964)—Shearing carry-over lambs. Agric. Gaz. N.S.W. 75 (10): 1318-21.

Watts, R. M. (1964)—Some aspects of disease control in N.S.W. Vet. Inspector, 28: 21-4.

F. DIVISION OF SCIENCE SERVICES

(i) BIOLOGY BRANCH

Plant Disease Leaflets

Anon.—Anthracnose or pod spot of beans. (No. 41.)

Anon.—Armillaria root rot of fruit trees. (No. 18.)

Anon.—Bacterial blight of beans. (No. 55.)

Anon.—Bitter Pit of apples. (No. 2.)

Anon.—Brown rot of citrus fruit. (No. 162.)

Anon.—Brown rot of stone fruits. (No. 4.)

Anon.—Club root of cabbages, cauliflowers, etc. (No. 76.)

Anon.—Collar rot and shell bark of lemon trees. (No. 161.)

Anon.—Deficiency Diseases of plants. (No. 130.)

Anon.—Diseases in the flower garden. (No. 141.)

Anon.—Diseases of carnations. (No. 115.)

Anon.—Diseases of clovers in N.S.W. (No. 155.)

Anon.—Diseases of dahlias. (No. 61.)

Anon.—Diseases of roses. (No. 109.)

Anon.—Diseases of stocks. (No. 119.)

Anon.—Downy Mildew of Onions. (No. 82.)

Anon.—Ergot of paspalum. (No. 104.)

Anon.—Freckle of stone fruits. (No. 16).

Anon.—Frost injury of wheat. (No. 123).

Anon.—Late blight of celery. (No. 63).

Anon.—Late blight of potatoes and tomatoes. (No. 39).

Anon.—Leaf curl of stone fruits. (No. 15).

Anon.—Manganese Deficiency in Citrus. (No. 160).

Anon.—Powdery Mildew of the the apple. (No. 13).

Anon.—Root and corm diseases of bananas. (No. 117).

Anon.—Sclerotium stem rot caused by *Sclerotium rolfsii*. (No. 114).

Anon.—Sooty moulds. (No. 21).

Anon.—Spraying programme for control of fungous diseases of coastal peaches. (No. 8).

Anon.—Tomato leaf mould. (No. 100).

Anon.—Transport and market diseases of vegetables. (No. 145).

Anon.—Virus diseases of potatoes. (No. 53).

Anon.—Virus diseases of tomatoes. (No. 37).

Hutton, K. E.—Black spot of apple and pear. (No. 9).
Kiely, T. B.—Black spot of citrus. (No. 11).

D. of A. Booklets

Hutton, K. E., Johnson, J. F. and Lloyd, N.C. (1965)—Orchard spray calendar. Tablelands and coastal highlands. Season 1965-66. (Published by N.S.W. Apple and Pear Growers' Association.)

Hutton, K. E., Lloyd, N. C. and Sweedman, R. (1965)—Orchard spray calendar. Mid-western Agricultural Region. (Published by Young Cool Stores Co-op. Soc. Ltd.).

Richards, R. J. (1965)—Starter cultures for the Dairy Industry. (Bull. No. S38).

Contributions to Journals

Anon. (1964)—Diseases of clovers in New South Wales. Agric. Gaz. N.S.W. 75 (8): 1204-11.

Anon. (1964)—Ergot of paspalum. Agric. Gaz. N.S.W. 75 (9): 1261-3.

Anon. (1965)—Interceptions in plant quarantine. Agric. Gaz. N.S.W. 76 (1): 41.

Anon. (1965)—New plant diseases. Agric. Gaz. N.S.W. 76 (1): 38-41.

Anon. (1964)—Virus diseases of potatoes. Agric. Gaz. N.S.W. 75 (8): 1195-1200, 1224.

Anon. (1964)—Yellow dwarf disease in N.S.W. cereals. Agric. Gaz. N.S.W. 75 (9): 1284.

Ballantyne, B (1964)—Lettuce necrotic yellows. Agric. Gaz. N.S.W. 75 (11): 1412-3.

Conroy, R. J. (1965)—The effect of time of infection by tomato yellow top virus on flower formation, fruit set and yield of tomatoes. Aust. J. Exp. Agric. An. Husb. 5 (17): 176-179.

Hutton, K. E. with Burchill, R. T., Crosse, J. E. and Garrett, Constance (1965)—Inhibition of the perfect stage of *Venturia inaequalis* (Cooke) Wint. by Urea. Nature 205 (4970): 520-521.

McLeod, R. W. (1964)—Penicillin levels in milk during feeding of procaine penicillin for bloat prevention. Aust. J. Dairy Tech. 19 (4): 165.

Richards, R. J. (1964)—Quality control for dairy products. Agric. Gaz. N.S.W. 75 (12): 1455-9.

Smith, A. M. (1965)—*Podosporiella verticillata* O'Gara associated with a newly recognised leafspot of cereals. Aust. J. Sci. 27 (9): 262-3.

(ii) ENTOMOLOGY BRANCH

D. of A. Booklets

Hutton, K. E., Johnson, J. F. and Lloyd, N.C. (1965)—Orchard spray calendar. Tablelands and coastal highlands. Season 1965-66. (Published by N.S.W. Apple and Pear Growers' Assoc.).

Hutton, K. E., Lloyd, N. C. and Sweedman, R. (1965)—Orchard spray calendar. Mid-western Agricultural Region. (Published by Young Cool Stores Co-op. Soc. Ltd.).

Contributions to Journals

Anon. (1965)—Black peach aphid, *Brachycaudus persicaecola*. Agric. Gaz. N.S.W. 76 (6): back cover.

Anon. (1965)—Cherry aphid, *Myzus cerasi*. Agric. Gaz. N.S.W. 76 (5): back cover.

Anon. (1965)—Clover root weevil, *Amnemus quadrituberculatus*. Agric. Gaz. N.S.W. 76 (4): back cover.

Anon. (1964)—Controlling mice and rats on the farm. Agric. Gaz. N.S.W. 75 (9): 1273-80.

Anon. (1965)—False loopers, *Plusia* spp. Agric. Gaz. N.S.W. 76 (3): back cover.

Anon. (1964)—Home orchard notes for August. Agric. Gaz. N.S.W. 75 (7): 1179-80.

Anon. (1964)—Home orchard notes for September. Agric. Gaz. N.S.W. 75 (8): 1243-5.

Anon. (1964)—Home orchard notes for October. Agric. Gaz. N.S.W. 75 (9): 1308-9.

Anon. (1964)—Home orchard notes for November. Agric. Gaz. N.S.W. 75 (10): 1370.

Anon. (1964)—Home orchard notes for December. Agric. Gaz. N.S.W. 75 (11): 1436-7.

Anon. (1964)—Home orchard notes for January. Agric. Gaz. N.S.W. 75 (12): 1501.

Anon. (1965)—Home orchard notes for February. Agric. Gaz. N.S.W. 76 (1): 60.

Anon. (1964)—Leaf-eating ladybird, *Epilachna 28-punctata*. Agric. Gaz. N.S.W. 75 (9): back cover.

Anon. (1964)—Plague thrips, *Thrips imaginis*. Agric. Gaz. N.S.W. 75: (8): back cover.

Anon. (1964)—Queensland fruit fly, *Dacus* (*Strumeta*) *tryoni*. Agric. Gaz. N.S.W. 75 (10): back cover.

Anon. (1965)—Tomato caterpillar, *Heliothis* spp. Agric. Gaz. N.S.W. 76 (2): back cover.

Anon. (1965)—Tomato mite, *Aculus lycopersici*. Agric. Gaz. N.S.W. 76 (1): back cover.

Anon. (1964)—White wax scale, *Ceroplastes destructor*. Agric. Gaz. N.S.W. 75 (11): back cover.

Anon. (1964)—Woolly apple aphid, *Eriosoma lanigerum*. Agric. Gaz. N.S.W. 75 (7): back cover.

Braithwite, B. M. (1965)—Control of banana rust thrips. Agric. Gaz. N.S.W. 76 (2): 115-9.

Chadwick, C. E. (1964)—The identity of *Dicyphus tabaci* Froggatt 1920. J. Ent. Soc. Aust. (N.S.W.) 1: 27.

Chadwick, C. E. (1964)—Obituary E. H. Zeck. Aust. Nat. 12 (4): 3-4.

Chadwick, C. E. (1964)—A tribute to E. H. Zeck. J. Ent. Soc. Aust. (N.S.W.) 1: 37-43, portrait.

Chadwick, C. E. and Mulder, R. H. (1964)—Note on *Apion terraereginae* Blackb. (Col.: Curculionidae). J. Ent. Soc. Aust (N.S.W.) 1: 25.

Chadwick, C. E. and Mulder, R. H. (1964)—Note on *Symbothynus* sp. (Col. Curculionidae). J. Ent. Soc. Aust. (N.S.W.) 1: 43.

Hughes, R. D., Casimer, M., O'Loughlin, G. T. and Martyn, E. J. (1964)—A survey of aphids flying over eastern Australia in 1961. Aust. J. Zool. 12: 174-200.

Jones, E. L. (1965)—The silver leaf mite and bud shed of peaches. Aust. J. Sci. 28: 27.

Leggo, D., Gellatley, J. G., Seberry, J. A., Peggie, I. D., Long, J. K. and Hall, E. G. (1965)—Post-harvest sterilization of oranges against Queensland fruit fly. Agric. Gaz. N.S.W. 76 (5): 274-8 (also C.S.I.R.O. Food Pres. D. 24 (1): 15-19).

Lloyd, N. C. (1964)—Red mite. Agric. Gaz. N.S.W. 75 (7): 1149-51.

Nikitin, M. I. (1965)—Insects from boxthorn berries and other non-commercial fruits in New South Wales. Aust. J. Sci. 27: 264-266.

Shanahan, G. J. (1965)—Mutations in the sheep blowfly, *Lucilia cuprina* Wied. 1. Studies on genes for white eye and dieldrin resistance. Bull. Ent. Res. 55: 709-713.

Shanahan, G. J. (1965)—A review of the flystrike problem of sheep in Australia. J. Aust. Inst. Agric. Sci. 31. 11-24.

Shanahan, G. J. (1965)—Susceptibility Tests with organophosphates against *Lucilia cuprina* Wied, the Primary Blowfly of sheep in Australia. Agric. Gaz. N.S.W. 76 (3): 180-2.

Wright, W. E. (1965)—Carbamate and organophosphorus sprays as alternatives to DDT to control red-legged earth mites (Halotydeus destructor and Penthaleus major). Aust. J. Exp. Agric. Anim. Husb. 5 (16): 68-74.

Wright, W. E. (1965)—Cotton insect pest control in the Namoi region of N.S.W. Agric. Gaz. N.S.W. 76 (1): 47-53.

Wright, W. E. and Nikitin, M. I. (1964)—A survey of insects of cotton in New South Wales. Aust. J. Sci. 27: 178-179.

(iii) CHEMISTRY BRANCH

D. of A. Booklets

Riddler, A. M. H. (1964)—Report on dune soils in the Barham District of New South Wales. Soil Survey Unit Bulletin 4.

Contributions to Journals

Almgren, Gustave (1964)—A grid for counting 1,000 grains. Agric. Gaz. N.S.W. 75 (9): 1298-1300.

Barnes, W. C. (1964)—Wheat production under irrigation for biscuits and other soft wheat usage. Agric. Gaz. N.S.W. 75 (10): 1322-6.

Bradley, J. and Fitzsimmons, R. W. (1964)—Wheat uniform fertilizer trials in New South Wales, 1959-61. Agric. Gaz. N.S.W. 75 (12): 1487-97.

Chatfield, M. G. (1965)—Fluorine in underground and surface waters in New South Wales. Agric. Gaz. N.S.W. 76 (4): 243-5.

Cradock, F. W. and Weir, R. G. (1964)—Citrus leaf analysis. Agric. Gaz. N.S.W. 75 (11): 1425-31.

Jacob, E. H. (1964)—Festiguay: The Cereal Chemist's report—a new mid-season wheat variety for northern N.S.W. Agric. Gaz. N.S.W. 75 (8): 1236-40.

Jenkins, I. D. and Short, A. L. (1964)—Salt—and its use in the dairy industry. Agric. Gaz. N.S.W. 75 (7): 1152-5.

Lattimore, C. W. and Short, A. L. (1965)—New device to help produce better butter. Agric. Gaz. N.S.W. 76 (3): 133-6.

Wilson, G. and Barkus, B. (1965)—Sub-tropical grasses for grazing. Agric. Gaz. N.S.W. 76 (4): 222-5.

(iv) BOTANY BRANCH

Contributions to Journals

Anon. (1964)—Raising plants from seeds. Agric. Gaz. N.S.W. 75 (10): 1371-3.

Grant, R. G. (1964)—Pruning shrubs. Agric. Gaz. N.S.W. 75 (7): 1181.

Tindale, Mary D. (1965)—*Acacia beckleri* Tindale sp. nov. (Published in Hj. Eichler, Supplement to J. M. Black's Flora of South Australia, 1965, p. 173-4.)

Tindale, Mary D. (1965)—A monograph of the Genus *Lastreopsis* Ching. Contrib. N.S.W. Nat. Herb. 3 (5): 249-339.

Watson, M. (1965)—On building a rockery. Agric. Gaz. N.S.W. 76 (2): 120.

Watson, M. (1965)—A place for conifers in your garden. Agric. Gaz. N.S.W. 76 (4): 253.

Watson, M. (1964)—Screens in the home garden. Agric. Gaz. N.S.W. 75 (7): 1178.

G. DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

Contributions to Journals

Anon. (1964)—Selecting a farm. Agric. Gaz. N.S.W. 75 (10): 1327-31.

Bird, J. G., Colman, R. L., Holder, J. M., Hudson, W. J. C., Swain, F. G. (1964)—Development and evaluation of pastures for dairy cattle in a sub-tropical environment. Proceedings of the ninth International Grassland Congress.

Bird, J. G. and Mason, G. (1965)—Budgets for planned irrigation on a typical Richmond Valley dairy farm. Review of Marketing and Agricultural Economics. 33 (1): 32-47.

Bird, J. G. and Mason, G. (1964)—The economics of spray irrigation on the far north coast of New South Wales. Review of Marketing and Agricultural Economics. 32 (4): 217-244.

Bird, J. G. and Moore, D. M. (1965)—Low incomes in agriculture—problems and policies in the O.E.C.D. Countries. Review of Marketing and Agricultural Economics. 33 (2): 109-117.

Byrne, P. F. (1964)—Parametric budgeting using a model of the sheep enterprise. Review of Marketing and Agricultural Economics. 32 (3): 95-136.

Cooke-Yarborough, R. E. (1965)—Overseas markets for Australian honey. Agric. Gaz. N.S.W., 76 (1): 9-12.

Cooke-Yarborough, R. E. (1964)—Recent trends in Australian honey consumption. The Australasian Beekeeper. 66 (2): 37-39.

Cooke-Yarborough, R. E. (1965)—Record turkey numbers in N.S.W. Agri. Gaz. N.S.W. 76 (3): 175.

Cooke-Yarborough, R. E. (1964)—The world honey industry and bee farming in Australia. World Crops. 16 (4): 35-39.

Donaldson, G. F. and Ryan, J. G. (1964)—Alternatives in handling grain at harvest. Agric. Gaz. N.S.W. 75 (10): 1340-5.

Donaldson, G. F. and Ryan, J. G. (1965)—The cost of owning and operating a header. Agric. Gaz. N.S.W. 76 (3): 162-7.

Donaldson, G. F. (1964)—The financing of agricultural research by levies on farm produce. Review of Marketing and Agricultural Economics. 32 (4): 183-216.

Druce, P. C. (1964)—Some developments in farm management extension in Australia. The Aust. J. of Agric. Ec. 8 (2): 112-123.

Ryan, J. G. (1965)—Cost-size and revenue relationships in the cotton growing industry of south-western New South Wales. Review of Marketing and Agricultural Economics. 33 (2): 53-100.

Throsby, C. D. (1964)—Theoretical aspects of a dynamic programming model for studying the allocation of land to pasture improvement. Review of Marketing and Agricultural Economics. 32 (3): 149-181.

H. AGRICULTURAL RESEARCH INSTITUTE, WAGGA WAGGA

Contributions to Journals

Anon. (1965)—The Agricultural Research Institute at Wagga Wagga. Agric. Gaz. N.S.W. 76 (1): 24-6.

Cuthbertson, E. G. (1965)—Advances in control of barley grass. Agric. Gaz. N.S.W. 76 (6): 333-6.

Cuthbertson, E. G. (1964)—Chemical control of skeleton weed in crops. Agric. Gaz. N.S.W. 75 (8): 1212-5.

Pugsley, A. T. (1965)—Breeding wheats resistant to loose smut. Agric. Gaz. N.S.W. 76 (6): 326.

Pugsley, A. T. (1964)—Semidwarf wheats for Australia. J. Aust. Inst. Agric. Sci. 30 (3): 166-8.

Smith, A. N. (1965)—Aluminium and iron phosphates in soils. J. Aust. Inst. Agric. Sci. 31 (2): 110-126.

Smith, A. N. (1965)—Distinction between iron and aluminium phosphate in Chang and Jackson's procedure for fractionating inorganic soil phosphorus. Agrochimica 9 (2): 162-8.

Smith, A. N. (1965)—The influence of superphosphate fertilizer on the yield and uptake of phosphorus by wheat. Aust. J. Exp. Agric. An. & Husb. 5 (17): 152-157.

Smith, A. N. (1965)—When and how to apply superphosphate to wheat. Agric. Gaz. N.S.W. 76 (4): 200-3.

Storrier, R. R. (1965)—A soil test for nitrogen? Agric. Gaz. N.S.W. 76 (3): 168-9.

Symes, K. J. (1965)—The inheritance of grain hardness in wheat as measured by the particle size index. Aust. J. Agric. Res. 16 (2): 113-23.

Taylor, A. C. (1965)—A microchondrometer for determining bushel weight. Aust. J. Exp. Agric. An. Husb. 5 (17): 158-160.

Warren, J. F. (1965)—The scalds of western New South Wales—a form of water erosion. Aust. Geog. 9 (5): 282-92.

Contributions to Technical Conferences

Storrier, R. R. (1964)—The effect of excess nitrogen on the yield and nitrogen content of wheat. Proc. 2nd. Aust. Plant Nutrition Conf.

Storrier, R. R. (1964)—The effect of excess water on yield and nitrogen uptake by wheat. Proc. 2nd. Aust. Plant Nutrition Conf.

J. DIVISION OF INFORMATION SERVICES

Contributions to Journals

Anon. (1964)—The Agricultural Bureau of N.S.W.—40th State Congress. Agric. Gaz. N.S.W. 75 (11): 1385-9.

Anon. (1965)—Coffee Break. Agric. Gaz. N.S.W. 76 (4): 251-2.

Anon. (1964)—Cornbread is easy to make. Agric. Gaz. N.S.W. 75 (9): 1306.

Anon. (1964)—Cotton—lusty new infant of New South Wales agriculture. Agric. Gaz. N.S.W. 75 (7): 1122-29.

Anon. (1964)—Country classics from Britain. Agric. Gaz. N.S.W. 75 (9): 1304-6.

Anon. (1964)—Education through the post. Agric. Gaz. N.S.W. 75 (7): 1166-7.

Anon. (1965)—The farm home—localize domestic lighting. Agric. Gaz. N.S.W. 76 (4): 246-50.

Anon. (1964)—Feminity is the "New Look". Agric. Gaz. N.S.W. 75 (6): 1114-5.

Anon. (1964)—Lawns need fertilizer. Agric. Gaz. N.S.W. 75 (9): 1303.

Anon. (1964)—A popular recipe for washing woollens. Agric. Gaz. N.S.W. 75 (8): 1245.

Anon. (1964)—Some recipes using capsicums. Agric. Gaz. N.S.W. 75 (10): 1369-70.

Anon. (1964)—Winter Warmth. Agric. Gaz. N.S.W. 75 (7): 1181.

Foskett, Nancy (1965)—How often do you see the bottom of the ironing basket? Agric. Gaz. N.S.W. 76 (1): 58.

Foskett, Nancy (1965)—Keep pace with the mending. Agric. Gaz. N.S.W. 76 (3): 183.

Martindale, Nina (1965)—A child's toy you can make. Agric. Gaz. N.S.W. 76 (2): 123-5.

Martindale, Nina (1964)—Don't. Agric. Gaz. N.S.W. 75 (9): 1307.

Martindale, Nina (1965)—Flame-proofing for home safety. Agric. Gaz. N.S.W. 76 (6): 379.

Martindale, Nina (1964)—Of service to rural families. Agric. Gaz. N.S.W. 75 (12): 1500.

Martindale, Nina (1965)—Proper care prolongs the life of foundation garments. Agric. Gaz. N.S.W. 76 (1): 61.

Martindale, Nina (1965)—A see-at-a-glance storage unit you can make. Agric. Gaz. N.S.W. 76 (5): 315-6.

Martindale, Nina (1965)—Suggested rules for judging ti-tree bark pictures. Agric. Gaz. N.S.W. 76 (3): 188-9.

Martindale, Nina (1965)—To make on a winter evening. Agric. Gaz. N.S.W. 76 (6): 377-9.

K. TAMWORTH AGRICULTURAL RESEARCH STATION

Contributions to Journals

Matheson, E. M. (1964)—Festiguay: The breeder's report—a new mid-season wheat variety for northern N.S.W. Agric. Gaz. N.S.W. 75 (7): 1174-5.

Single, W. V. (1964)—Frost damage to wheat crops—problems and progress in research. Agric. Gaz. N.S.W. 75 (10): 1314-17.

Single, W. V. (1964)—Studies on frost injury to wheat. II Ice formation within the plant. Aust. Jour. Agric. Res. 15 (6): 869-75.

Contributions to Technical Conferences

Thompson, J. A.—Criteria for evaluation of legume seed pre-inoculated with root-nodule bacteria. Aust. Plant Nutrition Conf. Perth 1964 Section A (d): 17-19.

L. YANCO AGRICULTURAL COLLEGE AND RESEARCH STATION

Contributions to Journals

Kable, P. F. (1965)—Air dispersal of conidia of Monilinia fructicola in peach orchards. Aust. J. Exp. Agric. An. Husb. 5 (17): 166-171.

Kable, P. F. (1965)—The fruit peduncle as an important overwintering site of Monilinia fructicola in the Murrumbidgee Irrigation Areas. Aust. J. Exp. Agric. An. Husb. 5 (17): 172-175.

Trimmer, W. A. (1965)—Filbert Nut growing. Agric. Gaz. N.S.W. 76 (5): 295-9.